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THE PHILIPPINE

Agricultural Review

VOL. III JANUARY, 1910 No. 1

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EDITORIAL.

During the past two years THE PHILIPPINE AGRICULTURAL REVIEW has been growing in favor with all classes in the Philippines so that with this number, which marks the beginning of its third year, the outlook is most encouraging and the field for the publication division of the Bureau is growing larger each year. There are far more actual readers of English and Spanish in the Islands to-day than ever before. The task of reaching that part of these readers which is interested in the farms of the Islands with the best agricultural information obtainable is the work of the REVIEW.

In accordance with established precedent the first number of each volume is devoted to the report of the Director of Agriculture for the last fiscal year; therefore this number is limited entirely to the report of the Director for the fiscal year 1908–9 as shown by the table of contents.

The growth of the Bureau during the past year has been marked and steady, and no radical changes have been made in the policy as outlined in the last annual report. The general appropriation of ₱525,000 by the Philippine Legislature for the fiscal year of 1909–10 as compared with the general appropriation for the preceding year of ₱350,000 shows a growing interest in the subject of agriculture; yet this appropriation is actually inadequate to satisfactorily carry on the work of the Bureau as outlined by the Secretary of the Interior and the Director of Agriculture.

The greatest effort made by the Bureau has been to get a sufficient number of veterinarians for the division of animal industry, and to make the work of this division as efficient as possible for the purpose of stamping out epizoötic diseases

amongst the farm animals of the Islands. The provincial veterinary service has been placed under the supervision of two of the most experienced and efficient veterinarians as traveling inspectors, one of whom has charge of the work in the Visayas and the other on the Island of Luzon. The force of this division of the Bureau has been gradually increased so that at the close of the fiscal year there were 22 veterinarians. At this date, January 1, 1910, by special arrangement this number has been increased to 44 veterinarians, 12 American agricultural inspectors and inoculators, and 52 native live-stock inspectors and inoculators. The work of stamping out epizoötic animal diseases has not only received the closest care and atttention of the Director of Agriculture but the active coöperation of the Secretary of the Interior and the Governor-General of the Islands, and it is believed that this division of the Bureau will soon have complete control of the spread of such diseases as rinderpest, surra, and foot-and-mouth disease, which have carried away so many of the farm animals in the Islands, without which it is impossible to carry on satisfactorily any agricultural work of importance.

In this connection it should be noted that the general quarantine depot including the live-stock quarantine station and the hospital for diseased animals at Iloilo has been completed. The general quarantine depot at Pandacan in Manila is well under way. The site at the Manila quarantine station will include not only sheds for the general quarantine of animals and hospital buildings for the care of sick animals, but the forage factory and the buildings for the College of Veterinary Science of the University of the Philippines.

Probably one of the most important problems in connection with the development of agriculture in these Islands is that of finding suitable draft animals for the use of Philippine farmers. For many purposes the carabao is too slow and too susceptible to disease, neither does it possess the requisite powers of endurance for a satisfactory draft animal on Philippine farms. In order to secure a better type of work animals the Bureau has imported some Indian cattle, to determine their suitability as draft animals for Philippine farmers. The results of experiments made with these cattle in Java, Brazil, and Jamaica give those concerned every hope that they will prove equally successful as draft animals in the Philippines.

Considerable work has been undertaken by the division of plant industry. A large number of varieties of rice have been sown and are being grown experimentally for the purpose of

determining the best kinds as to the quantity and quality for growing on Philippine farms. A fiber expert was sent into the field to study varieties of abaca and secure such data as is of interest to hemp growers. Other fibers are also being studied. Under Act 1898, providing for crop-reporting statistics, the division of statistics of the Bureau hopes to get more accurate and satisfactory information regarding the actual conditions of agriculture in the Islands and to accomplish a great deal during the coming year.

REPORT OF THE BUREAU OF AGRICULTURE FOR THE FISCAL YEAR ENDING JUNE 30, 1909.

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BUREAU OF AGRICULTURE,
Manila, August 9, 1909.

SIR: I have the honor to submit herewith the annual report of the Bureau of Agriculture for the fiscal year ending June 30, 1909:

The organization of the Bureau of Agriculture remains unchanged, consisting, as before, of three divisions—administrative, plant industry, and animal industry.

ADMINISTRATIVE DIVISION.

The development of THE PHILIPPINE AGRICULTURAL REVIEW, which has become a periodical of marked importance, and the necessity of closer supervision of this and other publications necessitated creating the position of superintendent of publications. It has been found convenient to merge the position of

property clerk with that of cashier, and to provide for a shipping clerk whose duties are the performing of all work necessary in receiving and dispatching property used by this office and its employees in the field. The position of chief clerk has been recreated. In order to secure better supervision of the veterinary work, the Islands have been divided into two districts; the first including Luzon and the other islands as far south as the subprovince of Romblon, and the second comprising the Visayan Islands and the regularly organized provinces of Mindanao. Two veterinarians have been designated as district veterinarians and one assigned to each of these districts, to act in a supervisory capacity.

PUBLICATIONS.

"THE PHILIPPINE AGRICULTURAL REVIEW."

THE PHILIPPINE AGRICULTURAL REVIEW was first issued in January, 1908, to bring the farmers throughout the provinces more closely in touch with the work of this Bureau, and to furnish them with literature relating to tropical agriculture. This publication has been appreciated by the people and the number of contributors from the provinces is increasing. The increased amount of work has made it necessary to appoint a superintendent of publications; accordingly Mr. E. A. Coddington, formerly a division superintendent in the Bureau of Education, was transferred to this Bureau to take charge of the work.

Each January number of the REVIEW has been given over entirely to the annual report and the following table gives an analysis of the subjects treated in the remaining numbers:

Crops.	Number of articles.	Number of pages.
Rice	8	26
Sugar	1	6
Tobacco	1	13
Hemp	3	11
Copra and coconuts	4	30
Rubber	7	57
Maguey	1	2
Cassava	1	21
Annatto	1	3
Peanut plant	1	17
Coffee	1	8
Cacao	4	46
Castor plant	1	5
Oranges	2	9
Silkworms	1	5

When the mailing list for the REVIEW was first prepared an effort was made to reach as many of the Filipino farmers as possible. Responsible people were asked to send in names of

those who could understand and profit by such a publication. The result was a very large list, particularly for the Spanish edition. As the REVIEW became better known and more widely distributed, requests continued to come in for copies, which resulted in a still larger list. It was thought that many of these copies were going to persons who had no particular interest in the publication but were receiving it simply because some friend had asked to have the REVIEW sent to them; therefore, printed cards were sent out to those in the provinces who were receiving the Spanish edition, asking them to fill these cards in and mail them to the Bureau if they desired their names continued on the mailing list. The result was a material decrease in the Spanish edition, which was reduced from 5,800 to 3,400 copies. At the close of the fiscal year, 1,661 English copies and 3,171 Spanish copies are being sent to the provinces of the Philippine Islands; 251 English and 209 Spanish copies are being delivered to the people in Manila; 724 English and 7 Spanish copies are being sent to the United States, and 320 English and 39 Spanish copies go to foreign countries. The total mailing list of the REVIEW now contains 6,382 names.

OTHER PUBLICATIONS.

As most of the data of interest to farmers in the Philippine Islands collected by workers in the Bureau of Agriculture are published from time to time in the REVIEW, there is very little left to be published in separate form. Only bulletins dealing with specific subjects, of a nature which makes them more technical than popular, are published in separate form. During the year General Order No. 13, dealing with quarantine regulations, was published under separate cover. Bulletin No. 7 of the regular series, entitled "The Garden," was published in March. This bulletin deals with the growing of foreign garden seeds which are thought to be adapted to the Philippine conditions. Another bulletin entitled "Coconuts" has been written but has not been published on account of lack of funds.

LIBRARY.

All books kept in the library of this Bureau belong to the library of the Bureau of Science and are held on memorandum receipt. Only such books are kept as relate directly to the work of this Bureau.

Aside from the books mentioned above, there are a number of pamphlets and bulletins published by the United States Department of Agriculture, the State experiment stations, and various

foreign agricultural societies. Most of this material is unbound, except that when complete sets are secured the Bureau of Science binds them and loans them to this Bureau on memorandum receipt. Quite a number of periodicals are being sent to the Bureau in exchange for THE PHILIPPINE AGRICULTURAL REVIEW.

STEAM PLOWING AND MACHINERY INVESTIGATIONS.

All the large steam plows and engines used in the steam plowing work of this Bureau have been described in previous reports, hence it is not necessary to go into detail as to description in this report, except in case where new machinery has not been thoroughly tested out.

PLOWS.

The four and six-disk "Private" plows, manufactured at La Crosse, Wisconsin, were tested in light, sandy soils, also in black soils comparatively free from sod and rubbish, and were found to work perfectly; but in heavy sod land, particularly when comparatively dry, the plows are not heavy enough to stay in the ground. These plows could be used to advantage on all sugar estates where the soil is sandy and comparatively free from sod.

ENGINES.

The Hart-Parr petroleum-burning engine mentioned in our last report has been given a thorough trial during the past year. It has proven a very desirable engine to use in those sections where fuel and water are scarce. It develops all the power claimed for it and is as easily handled as a steam engine of like weight and power. The engine has some structural defects which have developed by usage. The oil-cooling tank is not made sufficiently strong nor sufficiently well-braced to withstand the jolts and jars resulting from running the engine over rough ground. The large differential wheel is not sufficiently heavy to withstand the strain when the plow strikes on a stump or heavy sod. The engine is well adapted to use on sod land where the resistance is uniform, but when used on new rough land there should be a greater margin left between the maximum horsepower of the engine and the average resistance of the plow. This is shown by the fact that none of the defects mentioned above develop when the engine is used on land that has been plowed the previous year. The jar resulting from the heavy explosion has caused the spark plugs to get out of adjustment, but this is another structural defect which can be easily remedied.

SMALL PLOWS.

Small plows which have been purchased and sent by the Bureau to various farmers for the purpose of testing them in order to ascertain which make of plow would do the best work in soils may be classed according to merit as follows: Black land plow, manufactured by B. F. Avery & Co., Louisville, Kentucky; the John Deere Shetland pony plow, and the Oliver chilled rice plow, No. 1. One bullock can pull any of these plows easily and they do very excellent work in all soils except those covered with heavy sod.

The 10-inch "Prairie Queen" plow has given good results in a test at Alabang. With four bullocks ordinary cogon sod can be turned 6 inches with comparative ease, if the ground is moist. The method usually followed, however, is to first plow 4 inches deep then harrow the ground and cross plow 6 inches deep, which destroys practically all of the cogon and puts the ground into good shape for growing crops.

MAGUEY MACHINE.

The Prieto single wheel fiber-cleaning machine, as mentioned in our last report, has not been given a thorough test owing to the fact that the construction of the machine was faulty. That is, the shoe was not true, hence the knife touched the shoe in the middle but not at the sides. Owing to the construction of the machine it was impossible to remedy this without ordering a new shoe.

The Pioneer maguey machine has been sent to Cebu and mounted on a flat car for the purpose of demonstrating machine stripping along the line of the Philippine Railway Company. This company has been very active during the past few years in interesting the farmers along its lines in maguey planting, and a part of the maguey planted is now old enough to commence stripping. Circulars giving instructions as to the growing of maguey have been translated into the language of the province and distributed throughout this maguey-growing section. The Philippine Railway Company coöperated in the machine experiments by furnishing all transportation, fuel for operating the engine, and the labor. The people have become much interested in this work and it is expected that a larger and more up-to-date machine will be purchased and used for demonstration work during the coming year.

FORAGE FACTORY.

Machinery for the manufacture of forage from native products such as corn, beans, palay, and native fodders has been installed in a building erected at the stock yards near Pandacan. It is designed to take these native products and, after thoroughly drying and grinding, to so mix them as to make a balanced ration for horses, cattle, etc. This work, of course, is largely experimental but we hope to have the plant in full operation early in the coming year.

AGRICULTURAL EXTENSION WORK.

Señor Pablo Tecson, superintendent of agricultural extension work, visited eight provinces during the year, in the interest of agriculture.

CROP PESTS.

During the early part of the year a number of reports of damage done to crops by rats were received. Most of the parties making these reports requested information as to the best method of poisoning the rats. In order to obtain definite information as to the extent of the damage done and to ascertain whether or not rats were actually causing all the damage reported, Mr. David B. Mackie, an assistant agricultural inspector, was detailed on this work.

CROP REPORTING AND STATISTICS.

The system of crop and live-stock reporting and of statistical work adopted by this Bureau, as fully explained in the last two annual reports of the Director, has been in full operation about two years. The work has increased rapidly, as is shown by the following:

Fiscal year.	Monthly reports received from correspondents.	Number correspondents at end of year.
1907	1,628	370
1908	3,500	561
1909	7,155	696

For the first half of the fiscal year under review, Mr. T. R. Flack was statistician, having been followed January 1, 1909, by Mr. S. S. Sandejas as acting statistician, who was followed

on February 19, 1909, by Mr. W. D. Hobart, acting statistician at the present time.

No change has been made in the method of tabulating crop reports up to the present time. The monthly reports received from correspondents have been compiled by provinces, in which form they are published every month in THE PHILIPPINE AGRICULTURAL REVIEW, and segregated under subjects as well, so that all the information received regarding any kind of animal or the status of any crop is available under its respective head.

TOBACCO BOUNTIES.

During the year the Bureau furnished a representative to assist in awarding tobacco bounties, as provided under Act No. 1767. The committee in its report recommended certain changes in the law in order to distribute the bounties among a greater number of growers and to remove any possibility of unfair competition. The main features of these recommendations were framed into a law and passed by the Legislature late in the fiscal year.

DIVISION OF PLANT INDUSTRY.

This division includes all general plant investigations, seed distribution, laboratory and field tests of seeds, and work at the experiment stations. Experimental work is carried on at the following places: Singalong experiment station, located in the southern part of Manila on sandy soil, at sea level; Baguio experiment station, located at Baguio, subprovince of Benguet, at an elevation of 1,500 meters; Lamao experiment station, located at Lamao, Bataan Province, at sea level; and La Granja Modelo, located on an old Spanish model farm near La Carlota, Occidental Negros. The latter station is devoted largely to experiments in sugar cane, maguey, abaca, and rubber. A number of mares have been sent there during the past year with the idea of converting a part of it into a stock farm.

PLANT INVESTIGATION.

ABACA.

In the absence of a fiber expert, very little new work has been undertaken with abaca during the past year. The plants grown from seed at Singalong experiment station have been distributed; the plants grown at La Granja modelo are still under observation and will be used to enlarge the fields already started at this

farm. A man has been secured to undertake further investigations in the fiber industry, who will take up his duties at the beginning of the next fiscal year. A number of requests for abaca seed have been received but great difficulty has been experienced in securing it. Several parties promised to supply large quantities, but they have failed to do so.

MAGUEY.

The Bureau has continued to distribute large quantities of maguey to all parts of the Islands, particularly to Oriental Negros which seems to be especially well adapted to the growing of this plant. One million pole plants have been ordered from Hawaii to supply the demand in this section. The plantings of both the Hawaiian and the native maguey at Lamao and Occidental Negros have about reached the stage where experimental tests can be made with machine strippers. Owing to the fact that this plant is adapted to comparatively dry land, it is rather difficult to secure the fiber by retting, hence, if maguey-growing in the Philippines is to be developed very extensively, machine strippers will have to be put within reach of the small growers. As mentioned under the head of "Machinery Investigation," some work has already been done along this line with very favorable results.

KAPOK.

Very few calls have been received for kapok seedlings during the year. A large part of the seedlings growing at Lamao have been destroyed because they became too large for any use. Plantings have been made at Lamao and Alabang in order to make a commercial test; namely, to ascertain the yield per hectare where plants are grown in a field devoted exclusively to kapok. We have continued to collect data on the yield of kapok trees as found growing in the Islands. Most of these trees are sadly neglected from a commercial standpoint, as they are found growing either wild or in fence rows and, of course, the yield is comparatively small. Manufacturers in the United States and foreign countries are beginning to appreciate more and more the value of kapok and its use is being gradually extended, which insures a steady market for this product at a fair price.

RUBBER.

The three species of rubber growing at Singalong experiment station, namely, *Hevea braziliensis*, *Castilloa elastica*, and *Manihot glaziovii*, have continued to make satisfactory progress in

growth, as indicated by these measurements of their circumferences taken 1 meter from the ground:

	Circumference of—				
	Hevea braziliensis.		Castilloa elastica.		Manihot glaziovii 1909.
	1908	1909	1908	1909	
	Centimeters.	*Centimeters.*	*Centimeters.*	*Centimeters.*	*Centimeters.*
Tree No. 1	20.63	27.50	31.25	40.00	39.00
Tree No. 2	23.75	35.00	30.00	----------	46.00
Tree No. 3	22.50	33.13	37.50	42.50	51.00
Tree No. 4	26.25	35.63	27.50	36.88	----------
Average	23.28	32.81	31.56	39.79	45.33

The plantation of Ceara rubber at La Granja modelo has been extended so as to have a sufficient number of trees to make a commercial test of the tapping. The trees growing at Singalong experiment station and those at La Granja modelo are now large enough for experimental tappings.

COFFEE.

The Maragogipe coffee growing at Singalong experiment station has been comparatively free from rust and blight during the year. This coffee originated in the Kongo district and it is claimed that it is not subject to rust. Fifteen trees gave a yield of 16 kilos during the season. The berries are of medium size and fairly uniform in shape. No tests have been made as yet of the quality of the coffee, owing to the fact that all the berries collected have been used in filling seed requests. A part of these trees now stand about 2½ meters high. Three of the trees are so situated as to be shaded by rubber trees. While no figures have been kept to determine the difference in yield where the trees have been shaded, yet it is very noticeable that the trees in the shade are both more vigorous and more heavily fruited.

A small plantation of Liberian coffee is being set out at Lamao experiment station. The young trees were started in pots and then planted 5 meters apart each way. They are now about 1½ meters high and well loaded with berries. The trees have no shade and are given clean cultivation. No fruit has been harvested up to this time.

Some seeds from an Arabian coffee tree ten years old and free from blight were sent in by Mr. Currans, of the Forestry Bureau, from the Mountain Province. These were planted to see if plants could not be grown fairly resistant to the blight which is killing so many of the Arabian coffee trees in the Islands.

CITRUS FRUITS.

The orange trees growing at Singalong experiment station have borne irregularly during the year. Some of the trees that were full of fruit last year contain very little or no fruit this year. The Japanese oranges bear well, however, but the fruit is not marketable, being very sour and having no flavor.

The tangerine trees bore well last year, but this year only a few undersized, irregular-shaped oranges have set on the trees.

The lemon and grape fruit trees at Lamao station have made excellent growth during the year and have been exceptionally free from insect pests and diseases. One of the trees has set fruit.

Insect pests have done comparatively little damage to citrus trees during the past year.

AVOCADO PEARS.

The avocado pears growing at Singalong experiment station have so far failed to set fruit. In view of this fact it was thought best to secure some more seed and start a larger plantation. Accordingly a number of avocado pears were ordered from Hawaii and brought over in cold storage. As a result of this some thirty young trees were secured and transplanted at Lamao experiment station. These trees are growing nicely and it is hoped that some will be secured from this lot which will bear fruit.

BANANAS.

About seventy of each of the following varieties of bananas are being grown at Lamao experiment station, namely, *Sabá*, Chinese Dwarf, *Latundan, Bungulan, Gloria, Lacatan,* and *Matabia.* These have made good growth during the year owing to the fact that the dry season was comparatively short. A record is kept of the yield, shape, quality, etc., so that data will soon be forthcoming on these subjects. The Chinese Dwarf and *Latundan* have proved so far very heavy yielders and of extremely fine quality. A fungus has bothered them to some extent but this may not prove very serious. The Chinese Dwarf being comparatively low to the ground does not suffer so much from the winds as do the taller-growing varieties.

CORN.

All varieties of corn grown by the Bureau have been discarded except the large Mexican June corn, the first planting of which was made at Singalong experiment station in May, 1908. This first planting consisted of four rows about 100 meters long. Two of these rows were planted on level ground about one

meter apart; the other two on ridges about 20 centimeters high and 1.5 meters apart. This corn promised well nearly up to the time of maturity, standing some 2 meters high before tasseling. Most of the stalks seemed strong and vigorous but the yield was comparatively small, being only 400 kilos per hectare. This was probably due to several causes. First, the seed was not acclimated; second, the period of growth was almost entirely within the rainy season; third, the ground was comparatively flat and not sufficiently well drained for growing corn during the wet season. The crop was gathered from August 10 to 24, a few days over three months from planting time.

On October 26, 1908, seed from the above crop was planted on unplowed ground among some peanuts. On account of the presence of the peanuts all cultivation was done with hoes. The corn began to tassel the first week in December at about 1 meter in height, at which time the prospects for a crop even equal to the former were extremely poor. The earliest maturing stalks were detasseled to prevent self-fertilization. At about this time a fertilizer in the form of rotten cotton-seed was applied at the rate of about 2,000 kilos per hectare. From this time on the weather conditions were also more favorable and the corn soon reached a height of from 2 to 2½ meters. It eared fairly well, a large percentage of the stalks bearing two ears. The crop was gathered as it ripened, the first being picked February 1. The yield approximated 1,190 kilos per hectare and some of the best ears tested 73.4 per cent grain. There was considerable rain during the entire growing season, in fact there was really more rain than during the time the former crop was grown.

Another and a larger plat of this variety was planted on February 6, but owing to the seed being partially destroyed by ants the stand was comparatively poor and was replanted on February 27. The ground on which this crop was planted had been rather heavily dressed with stable manure some time previous. The planting was done in the usual way, namely, in rows about 1 meter apart and one-half meter in the rows. It was given sufficient cultivation to keep the ground thoroughly pulverized and free from weeds. There was one irrigation necessary during the driest part of the season. This corn began tasseling at about 1½ meters in height, the first appearing March 26; the silks appeared a week later. The first ripe corn was gathered May 21, about three and one-half months from time of planting. Owing to the fact that there was considerable replanting the last of this corn was not gathered until June 8.

Although nearly one-half of the planting had been replanted, the replant was not so good as the original planting, being slightly taller but not quite so heavily eared as the latter. The ears obtained from this planting were rather large, uniform in shape and size, being quite a decided improvement over the first crop. The yield was much better than the average crop of corn in the United States, being approximately 4,900 kilos per hectare, or about 60 bushels per acre.

The fourth planting of this corn was made on June 23, in order to ascertain if the small yield obtained during the rainy season was due to the fact that the corn was not acclimated, or whether or not the rainy season has a tendency to dwarf the plants. This corn has been distributed widely among the other farms and to private parties throughout the provinces. One party has been growing and selling it as green corn on the Manila market for ₱1 per dozen ears. We hope to have a sufficient quantity of this seed to distribute to all who may desire a start of it at the end of the next rainy season.

GUINEA GRASS.

Guinea grass has passed the experimental stage. A large number of those interested in the supply of green fodder for horses or cattle have recognized the value of this grass and calls for the roots have exceeded the supply. The Quartermaster's Department of the Army has recognized its value and promised to encourage the growing of it. Almost the entire area of land at Singalong experiment station has been devoted to the growing of this grass during the past year, for the purpose not only of furnishing roots to those desiring a start in the grass but to furnish *zacate* (fresh cut grass) to animals belonging to the Bureau in the city of Manila and at the Alabang stock farm. The results obtained in growing guinea grass at Singalong experiment station during the past year would seem to indicate that it may be grown throughout the dry season without irrigation. One plat of ground which had not been watered during the dry season, but had been frequently cultivated so as to keep the ground in good tilth, gave a yield of 50 tons per hectare at one cutting.

At the Baguio experiment station guinea grass has had a phenomenal growth, reaching a height of two meters and making very excellent feed. If there were a sufficient amount of ground at the Baguio experiment station for the cultivation of this grass the entire amount of grass and hay required for the stock farm could be furnished, thus saving the Bureau several thousand pesos each year now expended in purchasing forage.

PANICUM MOLE.

This grass is quite popular in the West Indies as a grazing grass and is adapted to soils that are frequently overflowed. Several packages of seed were secured through the courtesy of the Government stock farm at Ceylon and shown in boxes at both the Singalong and the Baguio experiment stations. A few plants were obtained at each place from the seed and have been transplanted into the open ground. It can be transplanted in a manner very similar to guinea grass, with the exception that this grass throws out roots at the joints which enables one to propagate it much more rapidly by cutting the stems into short lengths and planting them in the same manner in which the roots are transplanted. By some this grass is considered superior to guinea grass. It will take at least one season to determine its value under Philippine conditions.

SEED DISTRIBUTION.

Considerable difficulty has been experienced in the distribution of seeds this year, owing to the fact that there was some trouble in filling the order in the United States and it had to be canceled and the seeds reordered from Australia. For this reason the seeds which should have been distributed in November did not arrive until March. Hereafter, seeds will be ordered from Australia in order to prevent a recurrence of such a delay.

Only such seeds and plants have been distributed as were thought adapted to this country. Many of the vegetables adapted to a temperate climate do not do well in this climate at sea level but when placed in the higher altitudes, such as may be found in the Trinidad Valley, they do practically as well as in a temperate climate. Tomatoes, beans, peas, sweet corn, radishes, turnips, etc., were grown at Baguio experiment station during the past season with excellent results. The quality and size of the tomatoes were equal to those produced anywhere.

We have distributed during the year, 3,500 collections of vegetable seeds; 547 collections of flower seeds; 1,036,270 maguey plants; 9,703 mulberry cuttings and several carloads of guinea grass roots. The Maguey plants have been distributed principally in Negros and Luzon and the other seeds have been distributed practically over the entire group of Islands.

EXPERIMENT STATIONS.

Owing to the pressure of work in the veterinary division, sufficient funds have not been available to enlarge on the work already undertaken at the various experiment stations. Considerable work has been done along the line of systematizing

record keeping, etc., at these stations so that at any time a new man would be able to take up the work and carry it on as originally designed. As mentioned in our last report, the changes of men in charge of these stations are very frequent. For example, during the past year every farm under the management of this Bureau has changed hands except two, and one of these started with a new superintendent at the beginning of the year. This has been the case for a number of years and makes it very difficult to keep the experimental work at the various stations under full headway. Much of the progress of the work depends upon the individual in charge.

SINGALON EXPERIMENT STATION.

The work at Singalong experiment station was in charge of Mr. J. B. Thompson from the beginning of the fiscal year up to September 1, 1908, at which time he was transferred to the Alabang stock farm and Mr. H. A. Ireland, agricultural inspector, was placed in charge of the work.

The silk work at Singalong experiment station was under the charge of Mr. José Dizon, farm foreman, who has been looking after this work ever since it was started at Singalong. All of the silk grown during the past year has been reeled and woven into cloth at the experiment station. At the close of the fiscal year the silk work was discontinued at Singalong experiment station and all materials transferred to the Bureau of Science.

In view of the fact that the Bureau expects to abandon this station as soon as a suitable place is found for the property now located there, no new work was undertaken. All valuable plants have been removed to other stations and almost the entire area planted to guinea grass, for the purpose of supplying roots to those who wish them.

Labor conditions at this station remained practically the same as during the past year, About twenty-one laborers have been employed at different times, at an average daily wage of 89 centavos. This average daily rate varied slightly, depending upon whether or not a number of temporary men were being employed.

The equipment of this station has been reduced to the minimum by transfering all the machinery, etc., not needed, to either the forage factory or other stations. Practically all the live stock kept at this station is used for carromata purposes. Animals are sent there, however, from time to time, to await transportation to other places.

BAGUIO EXPERIMENT STATION.

This station has been in charge of Mr. M. C. Merrill throughout the year.

Most of the laborers at this station are Igorots. Igorot women are used when a sufficient number of men to carry on the work can not be obtained, but their services have not proven satisfactory. One of the greatest difficulties with the labor at this station is the fact that the Igorots do not work steadily, especially those who are paid by the day. They come and work for a few days, or possibly for a few weeks, and by the time they are broken in and beginning to be of some value they disappear and others are taken on. As a result, 133 different names have been on the pay roll during the year while the average daily number of laborers has been but 11.6. This disadvantage to the farm is a distinct advantage in one way, in that the Igorots by working a short time at the station absorb some modern ideas, some of which they will undoubtedly put into practice on their own farms. Thus there will be a gradual uplift among the Igorot farmers, who take naturally to agricultural pursuits. The average daily wage at this place is 54.6 centavos, exclusive of the native *capataz*.

Three heavy typhoons occured during the month of October which did considerable damage to the station by washing out several plats of strawberries that had just been set out and blowing down the old stable, some coffee trees and other plants, as well as doing damage to small bridges, etc.

By opening up the irrigation ditch and providing a temporary dam in the Balili River a sufficient supply of water was made available for all purposes.

In the absence of well-rotted stable manure which makes, perhaps, the best fertilizer for vegetables, commercial fertilizers have been used to a great extent; but the high price of the chemicals used in making these fertilizers makes their use almost prohibitive except where the vegetables can be sold at high prices.

Insects and plant diseases have given comparatively little or no trouble, although they have appeared in a number of cases; but the damage done was no more than one would expect in growing vegetables in any other climate.

Although handicapped by late arrival of seeds for planting, the results obtained in growing all kinds of vegetables at this station during the past year have been far above expectations. A sufficient quantity has been grown to supply all of the demands of the Baguio market and some of the surplus has been shipped to Manila.

Almost every kind of vegetable has been grown at this station during the past year. Careful data have been kept of all crops grown so that we shall be able to tell not only the yield of vegetables per hectare but the cost of producing the same at the price paid for labor at this place. As all of the data relating to vegetables will be published in separate form, further data relating to them will not be given here.

LAMAO EXPERIMENT STATION.

Work at this station has suffered considerably during the past year on account of the changes in superintendents. Mr. H. E. Stevens who had been in charge of the station for nearly a year previous left the station in September, 1908, leaving the work in charge of a *capataz* until March 3, 1909, when Mr. O. B. Burrell, agricultural inspector, was placed in charge of the station.

Labor conditions at this station remained practically the same as in previous years with the exception that at times the laborers have been scarce owing to the fact that there is a large sawmill in the immediate neighborhood which pays higher wages than the Bureau and sometimes takes away some of our best laborers. The average daily wage is about 75 centavos, not including the wages of the *capataz*.

The fact that this station is located away from any town keeps the laborers fairly well satisfied and there are comparatively few changes during the year except in the rush season when extra labor is taken on.

Owing to the proximity of Mariveles Mountain little damage was done by the typhoon which damaged other stations, as mentioned above.

This station could be made practically independent of rainfall by utilizing the water from the river which rises high up on the mountain and passes through the farm; but in order to put in an effective irrigation system it will be necessary to do considerable piping as the soil in the valley is very porous and open; so that even though a large stream of water were taken out a mile up the river very little would reach the station.

No very serious damage has been done to crops by insects or plant diseases; the most disturbing element that we have to deal with at this station is the wild hogs. They seem to be plentiful on the mountain sides and as soon as anything like corn, potatoes, or cassava is planted they break through the fences and do considerable damage to the crops. The fencing around this station is made mostly of bamboo and does not turn them very well. A heavy woven wire fence around the farm will be necessary to prevent damage from these animals.

The work at this station is confined mostly to the growing of tropical fruits and vegetables. The temperature is a little too high to grow foreign garden vegetables. It is expected that in the future all work with citrus fruits and native vegetables will be carried on at this station, unless a substation should be established in the orange district for work with oranges. There are a number of native vegetables growing in the Philippines which if properly selected and cultivated would be far superior for distribution among the farmers to the foreign vegetables now being introduced. For this reason it is thought wise to devote a part at least of the funds alloted to the station to the growing and selecting of native vegetables, with the idea of improving those which are already here rather than trying to acclimate vegetables from the temperate zone.

LA GRANJA MODELO.

The work at La Granja modelo was in charge of Mr. H. J. Gallagher from the first of the fiscal year until November 8, 1908, when he was transferred to the Alabang stock farm and Mr. F. E. Deason placed in charge at La Granja modelo.

The labor conditions at this station have continued good throughout the year except during the milling season when there is a scarcity of laborers and a high price must be paid for temporary men. The average wages paid is 75 centavos per day, excluding the *capataz.*

As this farm was an old sugar *hacienda,* the equipment of it consists largely of sugar machinery of the old type. If any modern work is to be done with sugar it would be necessary to put in new sugar machinery.

Where to obtain water for irrigating this farm continues to be somewhat of a problem. As mentioned in the last annual report, the river which borders it on one side is not available because the mills further downstream require its water to furnish power for grinding during the milling season, when water is most needed for irrigation. There is another river running through the property but on the opposite side of the farm which, it is thought, can be diverted so as to furnish more irrigation water. Were it not for the fact that the soil is porous and open, a reservoir could easily be constructed in which a supply of water could be stored for use during the dry season; but efforts along this line have so far failed for the reason mentioned above. There are about 80 hectares of land at this farm that could be irrigated.

The soil is well adapted to growing forage, especially guinea grass, and an effort is now being made to see if live stock, such

as horses and carabaos, can not be maintained at this farm at a much lower cost than at other farms now operated by the Bureau. An attempt was made some years ago along this same line but the horses were destroyed by glanders and other contagious diseases, so that the effort was abandoned for a while. The vicinity of La Granja modelo is comparatively free from such communicable diseases at this time, and it is thought that by keeping a veterinarian in the neighborhood the animals can be kept in fairly good health.

We have placed five of the Nellore cattle recently imported from India at this farm for the purpose of testing out their value at sea level. A full description of these cattle and their use will be found in another part of this report. The only feature that is worth mentioning here is that these animals are very quick in action and it is thought that they will prove quite valuable as driving animals in Negros. The cost of maintaining them at this farm should be very small because of the fact, as mentioned before, that guinea grass and other crops thrive very well there.

Heretofore the crops grown at this farm have consisted largely of sugar cane and corn. Six varieties of cane namely, native cane, Louisiana stripped, rose bamboo, Tiboo merdith, Demarara, and white bamboo have been tested at the station during the year, and recently plats of 1 hectare in extent were planted with the idea of growing some for free distribution. The Hawaiian maguey set out at this station in the fall of 1907 is now about large enough to begin harvesting. Another field of 2 hectares has been planted and is doing well. The field of Ceara rubber, mentioned in the last report, was damaged to some extent by the typhoons of last October.

AGRICULTURAL EXPLORATION.

Several different men have been engaged in this work during the year. Near the beginning of the fiscal year a party was put into the the field to inspect the coconut groves and eradicate the bud rot. They also collected data relating to the extent of this industry and methods followed.

Later, the party inspected the orange section and collected data as to the condition of the industry with the purpose of devising some plans for improvement.

During the rice harvest several men were in the field collecting data on varieties of rice and the rice industry in general. Samples were collected of as many different varieties of rice as could be found.

DIVISION OF ANIMAL INDUSTRY.

This division includes the control of animal diseases as carried on by the veterinary force, the production of serum, the breeding of animals at the stock farms, and all other general investigations in animal industry.

CONTROL WORK.

Considering the funds available and the difficulties under which the men have had to work in the provinces, considerable progress has been made in the control of contagious diseases in these Islands.

At the beginning of the fiscal year 14 veterinarians were on duty. This number was increased to 22 before the close of the year. However, only 14 of these were available for duty in the provinces, as 1 was in charge of the Trinidad stock farm, 1 in charge of the serum laboratory, 4 stationed at the ports of entry (Manila, Iloilo, and Cebu), and 1 was loaned to the Bureau of Prisons. Provision was made in the annual appropriation bill for a large increase in the number of veterinarians and it is hoped that before long there will be a sufficient number on duty to place one in each province with the necessary help to handle the situation, without shifting men from one province to another before they can really be spared from the work they are doing.

Provincial officials are now taking more interest in this work than formerly, and giving more aid in the way of maintaining quarantine and enforcing other regulations pertaining to the control of contagious diseases.

RINDERPEST.

Only two serious outbreaks of rinderpest have occurred in the provinces during the year; one of these was in the Cagayan Valley and the other in the Island of Siquijor. Neither of these localities had suffered from rinderpest for some time and the animals were very susceptible to the disease. The people did not appreciate the seriousness of the situation, and this made it very difficult to enforce the quarantine.

The method followed in treating rinderpest was to have corrals constructed in the infected barrios and all cattle found suffering from the disease were placed in the corrals under guard. When possible, the former corrals of all infected animals were thoroughly disinfected. All dead animals were buried or burned. An attempt was made to quarantine the infected barrios from those which were not infected, and the infected municipality from the adjacent ones. If sufficient serum was available

all exposed cattle and carabaos were inoculated. Whenever possible all carabaos in the infected barrios were examined daily by the veterinarians or inspectors and those found with the disease were removed to the corrals. An attempt was made to have the people keep their animals separate and not allow them to herd together, but this was found to be very difficult.

In carrying out this work as above outlined, it has been found to be advantageous to use as many native inoculators as the funds at our disposal will permit. This has several advantages: First, if an inoculator is properly trained in this work before being put into the field he is able to do the mechanical work, such as actually inoculating the animals, etc., which allows the veterinarian time to inspect outlying barrios and arrange for quarantine; second, the inoculator, is able to speak the language and get along with the people, whereas an American has considerable difficulty in making himself understood; third, in those sections of the provinces which are rarely visited by Americans a carabao requires very secure tying in order that the American may get at it and inoculate it, while a native may succeed in inoculating the animal without even tying it up.

After these men become thoroughly acquainted with the work necessary to be done, they can be left in charge of an infected area while the veterinarian goes to some other point. Heretofore, if the veterinarian had no help of this kind, he was forced to inoculate such infected animals as he could get together and then pass on to the next point. Frequently he never knew how many animals died after inoculation, nor did he know what effect his inoculations really had on the spread of the disease, except in cases where he could collect information from parties whom he knew were fairly reliable. One veterinarian and four or five trained inoculators can accomplish more than two veterinarians, and at less cost.

During the year 22,285 carabaos and 6,469 cattle were inoculated with anti-rinderpest serum; 3,322 carabaos and 312 cattle were reinoculated. Our reports show that 639 carabaos and 153 cattle died after inoculation.

SURRA.

Surra is undoubtedly second in importance to rinderpest and has apparently been more prevalent this year than last. Reports of the disease have come in from eighteen provinces. The only serious outbreaks have been on the Islands of Marinduque and Bohol, where it has done considerable damage. A total of 779 animals were found infected; 329 infected animals were killed by employees of the Bureau, and 166 other deaths were reported.

For the first time in several years this disease appeared in Manila, during April, 1909. Fortunately, however, it was soon eradicated and did comparatively little damage.

In dealing with this disease the blood of all susceptible animals in the infected district is examined. Horses found affected are killed, if possible, as the disease is always fatal to them. In most provinces the owner's consent must be secured before the animal can be destroyed, and in many cases this consent is denied. The only thing to do in such a case is to place the animal in quarantine or in an isolated spot until it eventually dies. It sometimes happens, however, that as soon as the officer is out of a district the animal is liberated and spreads the disease. Cattle and carabaos infected with this disease frequently carry it for a considerable time before showing outward symptoms and many after having it for a time recover; during this time, however, they serve as a means of spreading the disease. There should be some provision made whereby all animals suffering from surra could be destroyed at once and thus remove all possibility of their spreading the infection.

OTHER DISEASES.

Glanders has been found in eighteen provinces but there has been no serious outbreak and the damage resulting from it has been comparatively light. This disease affects only the equine species and occasionally human beings. Some 312 horses and mules were found suffering from glanders, 48 of which were killed by employees of this Bureau.

Foot-and-mouth disease has given considerable trouble in various sections of the Islands. It has appeared in some twenty-three provinces but since the quarantine service at ports of entry has been improved by putting in force General Order No. 13 the disease has steadily decreased until at the present time the provinces are comparatively clean. In combating this disease quarantines were established and instructions relating to the care of animals suffering from it were printed in Spanish and the native dialects and distributed among the people. Creolin and carbolic acid were sent direct, also through the provincial governors, to the people having affected animals. The medicine so distributed was greatly appreciated and most of it well used. Some 10,673 animals were found infected, and 125 deaths reported.

One hundred cases of ulcerative lymphangitis and 9 deaths were reported from ten provinces. The cases found were isolated and the owners instructed regarding the curative measures necessary to be taken.

Thirty-seven sporadic cases of hemorrhagic septicemia have been reported from five different provinces. By isolating the sick, disinfecting the infected areas, and burning the dead, the disease has been prevented from becoming epizoötic.

Only 67 cases of hog cholera have been reported from four provinces, but the disease has been more general than these figures indicate. Because of the prevailing custom of allowing swine to roam unrestricted and the absence of facilities for confining them, this disease will be a difficult one to control in this country. The numerous wild hogs to be found in nearly all parts of the country are often responsible for spreading this as well as other diseases.

A most beneficial factor in the control of animal diseases has been the operation of the new quarantine regulations. At the beginning of the year, the Bureau was operating under General Order No. 10 which permitted the landing of infected animals from foreign ports until three successive infected shipments had been landed from a given port, after which landing permits for all cattle and carabaos from such port were to be refused. No great good came of the enforcement of this rule since by shifting ports dealers were able to land some 2,325 diseased cattle and carabaos from the infected area before a single port was closed by the operation of this rule. About this time General Order No. 12 was issued, under which landing permits for infected shipments were to be refused, except for immediate slaughter. General Order No. 12, together with some revised rules and regulations relating to quarantine work, was reissued February 1, 1909, as General Order No. 13. The enforcement of this last general order resulted in our being able largely to prevent the spread of infectious communicable diseases from ports of entry. While conditions have improved, particularly at ports of entry, infection will continue to come in from time to time so long as shipments from infected ports are allowed to land, although upon the date of inspection they are apparently free from infection. Some very interesting data have been collected upon this subject. It has been found, for example, that prior to November 2, 1908, 10,254 cattle and 1,424 carabaos were landed in Manila free from disease, and that 2,216 cattle and 109 carabaos were found diseased, but landed. Of this number only 2,270 were embarked at the port of Hongkong. During the same period, 1,172 cattle were landed in apparently good condition, but were considered to have been infected before landing because they developed disease soon after. This entire lot was embarked at the port of Hongkong. During the same

period, 11,073 cattle and 79 carabaos were found infected and refused landing permits except for immediate slaughter, with the exception of the carabaos which, in this case, were held on lighters until it was ascertained that they were free from disease. Of this number all but 803 were embarked at the port of Hongkong. These figures would seem to point to the source of infection.

QUARANTINE STATIONS.

Upon removal of the serum herd from San Lazaro the stables and houses were retained to be used as an immunizing station for cattle and carabaos. During the year such animals as it was found necessary to quarantine in Manila for rinderpest have been taken to San Lazaro. The number of animals belonging to private parties brought to this station for immunization was not so large as had been expected. This has been due in great part to the scarcity of desirable work animals coming to this market and to the fact that the buyers of those arriving needed the animals immediately and could not wait to have them immunized. As mentioned in our last report, the stalls, etc., at San Lazaro were in very poor condition, but provision has been made in the current appropriation for replacing the old wooden floors with concrete and providing proper drainage, so that in the near future we shall be in a position to properly care for all animals taken to that place.

The new stock yards and quarantine station at Pandacan will not be finished and ready for use before the middle of the coming fiscal year. The ground has been filled in with sand to a level of 12 meters. A contract for twelve cattle sheds to be constructed of concrete with tile roof has been let and they will be finished soon. Each shed will have a capacity of one hundred head. It is expected that the number of sheds will be doubled in the near future.

The quarantine station at Iloilo was completed shortly before the close of the fiscal year. This station is sufficiently large to take care of all animals expected to arrive in Iloilo for the next few years. The only objection that can be raised to the station is the fact that it is located too far from the point of disembarkation.

Funds were not available for the building of a quarantine station at Cebu. Animals landed there are cared for in the corrals of the owners.

Temporary quarantine stations have been maintained at Lemery and Taal. As these points are the gateways to Batangas

and Tayabas Provinces, all animals coming from adjacent islands and provinces can be inspected and the spread of diseases largely prevented. During the latter part of the year, however, the men on duty at these points were withdrawn, owing to the fact that there were no funds available to pay their salaries. They will be replaced early in the next fiscal year.

A temporary station was established at Nozo, on the trail between Nueva Vizcaya and Pangasinan in order to protect the Province of Nueva Vizcaya against the disease which has broken out in Pangasinan. Carabaos and cattle passing over this trail to Nueva Vizcaya are detained for a period of five days. This quarantine has been effective so far, as rinderpest has not yet appeared in Nueva Vizcaya.

SERUM LABORATORY.

In October, 1908, the new buildings for housing the serum herd and the new serum laboratory at the Alabang stock farm were completed and the serum herd moved to the farm. This farm is located in Rizal Province 22 kilometers from Manila, on the line of the Batangas Railroad. The laboratory is constructed of reinforced concrete and has proven highly satisfactory. The bullock shed is of simple open construction, with iron roof and concrete floor. It is built in the form of an E, with a capacity practically double that originally intended. It is capable of holding 278 bullocks, aside from its box stalls for animals requiring special attention. Proper drainage has been provided, so that all water is carried from the concrete floors into gutters which lead into an underground sewer emptying some distance from the shed, thus reducing the danger of infection in case disease should break out among the herd. Pure water is supplied from an artesian well on the other side of the river.

A steam boiler has been located about a hundred meters from the laboratory for the purpose of furnishing steam for sterilizing, etc., as well as steam to cook the animals killed for virulent blood and those which die from various other causes. It is the intention to thoroughly cook these animals and use the cooked meat for fertilizer or feed as it may be required. It is estimated that this will result in a saving, because it costs a considerable sum to burn or bury virulent blood animals, and even after they are buried dogs sometimes dig into the trenches and spread the contagion through the barrios near the farm.

The production of serum was interrupted several times during the year by the appearance of foot-and-mouth disease in the herd. While the outbreaks did little damage to the animals in

the herd there was considerable falling off in the amount of serum produced. In spite of these difficulties, however, 3,495.5 liters of serum were sent to the Bureau of Science, as compared with 1,800.9 liters for the previous year. Excellent results have been secured in separating the serum from the coagulum. Accurate records show a separation of 38.38 per cent, the separation for the two previous years being 22.7 per cent and 28.6 per cent, respectively.

Only 7.4 per cent of the animals used for the production of serum were lost during the process of immunization. Ninety-eight animals were expended in securing virulent blood. Most of the animals used for virulent blood purposes were native cattle. The cost of maintaining these is comparatively small owing to the fact that they subsist largely on hay or native grass.

ALABANG STOCK FARM.

Alabang stock farm was in charge of Mr. Harold M. Knight from the beginning of the fiscal year until September 1, 1908, at which time he was succeeded by Mr. J. B. Thompson, who returned to the United States about January 1, 1909, and was succeeded by Mr. H. J. Gallagher, formerly superintendent of La Granja modelo.

The rainfall at this farm during the last two years has been rather remarkable in that it has frequently happened that for days at a time, at the beginning and close of the dry seasons, it would be raining near the mountains to the south and in Manila while at the farm it would be perfectly dry. This is probably due to the wind currents, which are more or less influenced by the position of the mountains. This marked dry period necessitates more or less irrigation in order to grow crops successfully. For this purpose two artesian wells have been dug on the farm. The first one dug gives an abundance of water at all times; in fact, a 6-inch pump running for ten hours per day and for six consecutive days failed to lower the water appreciably, the water standing within about 9 feet of the surface. From this source we have been able to irrigate something like 12 hectares of land during the past season and have made ditches for irrigating twice that much during the coming dry season.

It was thought for a while that guinea grass would not thrive on the stiff clay soil at this place, but by carefully preparing the land and making a liberal application of stable manure it has grown about as well as in Manila. The area being planted to guinea grass is being extended and we hope that in the near future we will have a sufficient amount growing to supply all the green grass needed.

During the dry season the lowland along the river was planted in sorghum. This was planted in an open trench and irrigation water turned in to thoroughly wet the soil and sprout the seed. The high ridge between the rows did not become moist enough to sprout the grass, hence the crop of sorghum was grown without a single cultivation. The yield of fodder from this crop was very heavy.

Sorghum, corn, and teosinte grow well on the hill lands during the rainy season and large areas of these crops are planted for feed during this time. As the land on which this farm is located had not been under cultivation for a long time (ten or twelve years), wild native grasses had secured a good start. It required considerable heavy work with steam plows to kill out the cogon grass and bring the land into a thorough state of cultivation. Some of the fields were plowed as many as three times. Much more of this work will have to be done before a sufficient area is under cultivation to supply all the feed that is required for the animals kept on the farm.

This farm has been visited during the year by a number of swarms of locusts, which have caused considerable damage to growing crops. No other insect pests have done serious harm.

A number of buildings have been completed during the year and a few more will be necessary to house all the stock and provide quarters for the men before the farm can be considered in good working order. Among the buildings completed are a dairy and goat barn, thirteen new houses for laborers, and a dwelling house for the superintendent and other employees located at the farm. A concrete tank holding 24,000 gallons of water is located on a hill 90 feet high, to supply water to all the buildings on the farm. The barn room is not sufficient to properly house all the horses kept at this farm and it will be necessary to provide some additional shelter in order to take care of the increase in young stock each year.

The American and Australian cattle kept at this farm have not done well in spite of the fact that they have received at all times a liberal ration of concentrated feed. The amount of milk given by the cows is about one-half what it would have been in the United States under similar circumstances. The young calves are always weak and many of them die before the weaning period, while the mestizo calves and Chinese cows have kept in good condition upon nothing but native grass, even during the dry season. A sufficient length of time has been given to this matter to settle practically once for all the question of growing pure breed cattle from the temperate zone, and it is

recommended that no further attempt be made to grow this class of cattle, but to confine our efforts to the growing of mestizos, using the Chinese or Spanish cows and high grade mestizo or full-blood American or Australian bulls.

Since the first of the fiscal year our horses have been increased at this farm by transfer from the Army of 33 mares, 42 colts, and 1 stallion. These animals were received in fairly good condition, but some of the colts had strangles which spread among the other horses on the farm causing considerable trouble and the death of 5 colts during the year. This Army stock was transferred to the Civil Government at an appraised valuation with the understanding that all animals raised are to be offered to the Army at an appraised valuation as soon as they are old enough to be of service as mounts. The valuation of these animals is fixed by a committee of three, one of whom is appointed by the Director of Agriculture, one by the Quartermaster's Department, and the third member selected by these two. Young stock returned to the Army will be appraised in the same way. Many of the mares taken over from the Army for breeding purposes are coarse and rough and are not at all desirable for the production of first-class colts, but the worst of these can be weeded out and within a few years a well-selected lot of animals can be gotten together. A policy has been adopted of confining the breeding work on each of the farms to certain lines. For example, it is intended to confine the work on the Alabang stock farm to the production of full-blooded American colts and others known as Native-American colts; in the first instance using American sires, such as Morgan, and American mares, and in the second place using a large type of native stallion and American mares. Only a small percentage of American mares will be used in the production of full-blooded American colts.

The pure-breed Maltese goats, as mentioned in our previous report, have not developed as satisfactorily as it was hoped. The young goats are very delicate and many of them do not survive the first three months. The half-breed Maltese goats are much better, however; they require less feed and a greater number of the young reach maturity. The milking qualities of these goats have not come up to expectation, probably for the same reason that the pure-bred American cows do not do well here. At the beginning of the fiscal year we had in our flock two imported Spanish female goats. These were both splendid milkers and did well. Accordingly, another lot was ordered from Spain, which arrived on June 4, 1909, consisting of 17 goats, 3

full-grown males, 12 females, and 2 kids. These have not been here sufficiently long to say anything definite as regards their adaptability, but, judging from the appearance and the development of the two that the Bureau has had for some time, it is hoped that they will prove highly satisfactory. During the coming year some 25 large female native goats will be purchased for the purpose of raising mestizo Spanish and Maltese goats for distribution among the farmers in the provinces. Nearly every farmer in the provinces has at least a few goats and anything that can be done along the line of improving these will be of great value to the people.

While the full-blooded American horse and the full-blooded American cow do not thrive well in this country, the American hog seems to be perfectly at home. Apparently he is able to adapt himself to the country and conditions without any trouble. The young develop well and grow rapidly; in fact, some of the young pigs sent out from this farm have been as fine a type of Berkshire as one would wish to see. The breeding herd on this farm has been doubled during the past year and it is expected that during the coming year it will be again doubled. New stock will be introduced and an attempt made to supply the demand for young Berkshire pigs. These animals are sold without difficulty at about the same price they would bring in the United States and, barring diseases such as hog cholera, it is confidently expected that this branch of farming will probably be the best paying of any undertaken and do more good to the people, as the hog, like the goat, is found in every barrio and on every farm. The native farmer is particularly proud of his hogs, hence, they are fairly sure of good treatment wherever they are sent.

The growing of guinea pigs at this farm for use at the Bureau of Science has proved a comparatively easy matter. Guinea pigs are easy to raise, requiring only a good quality of *zacate* and proper attention as to keeping the nests and houses clean. During the year 1,022 guinea pigs have been used by the Bureau of Science.

The raising of rabbits for scientific purposes has not been so successful. Very few of the young Japanese rabbits survive the first weeks and a comparatively small percentage of those which survive reach maturity. The Australian rabbits do not take kindly to confinement and many of them die *en route* or after they reach the farm. An experiment is being tried in allowing these animals to run out in an open lot where they will have plenty of cover but will be provided with feed, in order to

ascertain whether they will be more prolific under these conditions.

Three stallions, "Handrail," "Thoughtful," and a stallion transferred from the Army have been campaigning in Batangas from February 20 to the end of the fiscal year. The interest in horse breeding has increased wonderfully in Batangas during the time these stallions have been kept there. The man in charge of this work reports that the price of good brood mares has increased 100 per cent during the past year.

TRINIDAD STOCK FARM.

No changes have taken place in the management of this farm, Dr. C. M. Morgan having been in charge during the entire year. Labor conditions at this farm are practically the same as described under the head of the Baguio experiment station. The Igorots, when they remain long enough to become trained, make very good hands with horses and cattle. The price paid for labor is practically the same as at the experiment station.

There has not been any scarcity of feed at this farm during the past year, owing to the fact that rains have been abundant and grass plentiful. A small part of this valley which heretofore has not been used has been fenced for the purpose of pasturing horses belonging to Igorots, in order that the owners may not be at any expense for feeding their animals when left at the farm to be bred. Very little or no forage is grown at this farm, most of the land being in pasture or lots.

One of the grass-covered pony sheds which was in a very dilapidated condition has been replaced by a new wooden structure having a capacity for accommodating 19 horses, with a feed room and open shed 20 by 30 feet for the use of the animals during stormy weather. Three of the cattle sheds which were destroyed by the October typhoon have been rebuilt. The horse barn has been repaired by splicing the posts and rebuilding the rock wall. Some other minor repairs were needed but funds were not available for any further work.

The live stock at this farm consists of horses, cattle, sheep, and goats. The plan for horse breeding has been revised and in future will consist mainly of the production of American-native colts, namely, using an Arabian or Morgan stallion and large native mares. A few full-blooded American mares will be kept for the production of full-blooded American colts.

The horses at this farm have done exceedingly well during the entire year. All the young colts are thrifty and are making

satisfactory growth. The only difficulty that we have experienced in handling these animals has been a lack of shelter during the heavy rains. Considerable work has been done also among the Igorots in encouraging them to breed better horses and take better care of them. Most of the Igorot farmers have horses and take considerable interest in the industry.

The cattle kept at this station consist of a herd of about 40 native cows and a Galloway bull. The offspring are very thrifty and thrive on the pasture, requiring comparatively little help by feeding except during the baguios and continued rainfalls. A good many of the mestizo bulls have been scattered throughout the provinces and good reports come from them wherever they have been placed.

During the latter part of the fiscal year seven Nellore cattle, consisting of six cows and a bull, were sent to this station for the purpose of testing their value in the mountain districts. A fuller description of these cattle will be found in another part of this report.

The flock of sheep kept at this farm consists of nine Southdown ewes and a ram. These have been doing very well, except that the quality of wool produced is not very good on account of the excessive rainfall which tends to make it rather coarse.

The goats kept at this farm are of the Angora breed. They have thrived very well, as goats do in all parts of these Islands. Since there is no particular reason why these goats should be kept at this farm and since the expense of keeping any animal here is considerably greater than at other farms nearer sea level, arrangements have been made for the transfer of these goats to the Alabang stock farm where the other breeds of goats are kept. Taking everything into consideration, the prospects for live-stock raising at this farm are very encouraging.

NELLORE CATTLE.

During the latter part of the year the Bureau received a small shipment of Indian cattle, consisting of 10 cows and 2 bulls, all choice specimens of the Nellore breed, the majority being prize winners at the annual cattle show held at Ongole, Madras Presidency. The bulls are very fine specimens weighing about 570 kilos each and stand about 164 centimeters in height. They are of light fawn color with dark points, having very fine, soft hair and loose flexible skin. The females weigh about 365 kilos each and stand about 153 centimeters in height. They have the same quality of hair and skin as the males but are a little lighter in color. The high head,

prominent hump, straight back, and general trimness combine to give these animals a very majestic and pleasing appearance. They are admired by all lovers of good animals.

A short description of this breed of animals is as follows: Head in general comparatively small, short and broad with fine muzzle; mouth small; nostrils comparatively large but not coarse; eyes large and bright; ears long and drooping; horns heavy and curving upward; neck broad, short, and deep; hump very prominent, especially in the male, where it stands some 8 inches or more above the neck; shoulders compact, especially at the top; dewlap excessively developed hanging, in some instances, below the knees; legs long and clean, giving evidence of good quality; feet small; hoofs of good texture; chest deep and fairly broad; ribs long and arched; back very straight and fairly broad; loins extra long and deep; flanks full and low; hips small but a little narrow; rump short and drooping; thighs long and heavily muscled; tail long and tapering, brush heavy. The hind legs seem to be a little longer than the fore legs, causing the animal to be higher at the top of the hip than at the point just back of the hump. These cattle have long been noted for their pleasing appearance, large size, and wonderful ability to withstand hard labor. They have been introduced with success into Java, the West Indies, some parts of the United States, Brazil and other countries. The cattle tick seems to bother them very little; in fact, it is very seldom a cattle tick is found on these animals even though they may be in a pasture badly infested with them. They have the advantage over ordinary Chinese cattle in that they are heavier, swifter in action, and more easily managed. If they adapt themselves to Philippine conditions it is expected that they will do a great deal toward solving the problem of securing work and road animals in these Islands.

PORT OF MANILA.

During the fiscal year ending June 30, 1909, a total of 103,679 animals were inspected on arrival at this port. Inspection fees amounting to ₱17,422.30 were collected on 102,379 animals. One thousand three hundred animals were inspected without fees, as they were for the military and branches of the Civil Government. Certificates of health were issued for 13,843 animals leaving the city of Manila. The health of the animals in this city has been very good except for an occasional outbreak of foot-and-mouth disease and rinderpest. Most of these outbreaks have been small and comparatively easy to control.

PORT OF ILOILO.

During the fiscal year 9,312 animals were inspected on arrival at this port and 2,865 were inspected before removal. No fees were collected. Of the 509 head of cattle and 585 head of carabaos arriving from foreign ports, 118 head of cattle and 39 carabaos were found diseased. No serious outbreaks of disease occurred at this port during the year.

PORT OF CEBU.

During the year 4,327 animals from interisland ports and 649 from foreign ports were inspected upon arrival. Certificates of health were issued for 491 animals leaving the city. No fees were collected at this port.

INSPECTION AT THE ABATTOIR.

The Bureau has continued during the year the ante-mortem and post-mortem inspection of animals at the *matadero* in Manila. This work required about half the time of one veterinarian and three live-stock inspectors. During the year 93,939 ante-mortem and 90,229 post-mortem inspections were made, 914 whole carcasses and 86,364 parts of carcasses were condemned as being unfit for human consumption. No fees were collected by the Bureau for this work.

ADDENDA.

There are attached to this report a number of exhibits containing matter which relates to work of this Bureau but is not of sufficient importance to be embodied in the regular report.

Very respectfully,

C. M. CONNER,
Acting Director of Agriculture.

The Honorable,
the SECRETARY OF THE INTERIOR, *Manila, P. I.*

APPENDIX.

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EXHIBIT A.

The following changes have been made in the personnel during the year:

APPOINTMENTS.

Name.	Class.	Date appointed.
John L. Gross	Veterinarian	Sept. 28, 1908
Paul H. Burnett	do	Oct. 19, 1908
Clarence S. Bucher	do	Oct. 28, 1908
Walter A. Korb	do	Do.
Burtrand J. Eno	do	Do.
Stephen O'Toole	do	Nov. 16, 1908
T. Irving Miller	do	Mar. 5, 1909
Henry F. Hungerford	do	Mar. 27, 1909
Clifton B. Shoemaker	do	Do.
Fred J. Lauman	do	May 6, 1909
Harriet Hayes	Clerk	Oct. 12, 1908
Alfredo Amorsolo	do	Feb. 1, 1909
Francisco Guerra	do	Do.
Abbie Allen	Stenographer	Jan. 4, 1909
David B. Mackie	Assistant agricultural inspector	Jan. 17, 1909
Orange B. Burrell	Agricultural inspector	Mar. 13, 1909
José G. Sanvictores	Agricultural assistant	Mar. 1, 1909
Silverio Apostol	do	Apr. 14, 1909
Mariano M. Cruz	do	Apr. 21, 1909

TRANSFER TO THIS BUREAU.

Name.	Class.	Date appointed.
Thomas L. Bean	In charge small animals	July 1, 1908
Ignacio V. González	Clerk	July 7, 1908
William D. Hobart	do	Jan. 8, 1909
Sam. E. Sherard	Agricultural inspector	Feb. 1, 1909
Ernest A. Coddington	Superintendent of publications	Feb. 17, 1909
William E. Cobey	Chief clerk	Apr. 12, 1909

RESIGNATIONS.

David G. Moberly	Veterinarian	Oct. 6, 1908
Eugene J. Snyder	do	July 4, 1908
Alonzo S. Shealy	do	Mar. 20, 1909
Harry A. Forester	do	Apr. 12, 1909
Clarence S. Bucher	do	May 13, 1909
F. L. McVeigh	Cashier and disbursing officer	July 31, 1908
A. W. B. Frederick	Farm foreman	Nov. 30, 1908
Victor Buencamino	Clerk	Sept. 12, 1908
Sylvia S. Kennedy	do	Dec. 27, 1908
Sixto S. Sandejas	do	Mar. 10, 1909
Harry E. Stevens	Agricultural inspector	Mar. 19, 1909

TRANSFER FROM THIS BUREAU.

Harold N. Knight	Farm superintendent	Sept. 10, 1908
José G. Sanvictores	Agricultural assistant	May 29, 1909
Harold Guzner	Agricultural explorer	May 31, 1909

REINSTATEMENTS.

David G. Kretzer	Veterinarian	Sept. 28, 1908
F. L. McVeigh	Clerk	Feb. 10, 1909

There has been a gain during the year by appointment of 28, and a loss by resignation and transfer of 14, making a net increase of 14. The employees both permanent and temporary, other than day laborers, who have been in the service during the year number 150. The average number of employees has been 69.

EXHIBIT B.

AGRICULTURAL EXTENSION WORK.

By PABLO TECSON.

Upon recommendation of the municipal council of San Miguel, Bulacan, an abandoned system of irrigation situated in the barrio of Kinamatayang-Kabayo was inspected during the last days of June, 1908, with a view of ascertaining the extent of territory and the number of owners of arable land which would be benefited by reconstructing and extending the system.

This system of irrigation was constructed during the years

1894 and 1895 by a resident landowner of the municipality of San Miguel, but on account of the unsettled condition of the Government which prevailed for some time after this, the system was neglected and partially reverted to its original state. For economic reasons the person who constructed the system signified his willingness to cede to the Government whatever right he had to the system, provided that the Government would reconstruct and improve it.

An investigation of the surrounding country shows that an area of 4,000 hectares valued at ₱1,000,000, owned by one hundred and fifteen different parties and extending through the municipalities of San Miguel, Bulacan; Candaba, Pampanga; San Isidro and Gapan, Nueva Ecija, would be benefited by this system of irrigation. While the water supply during the dry season might be somewhat limited, the system of irrigation could be so constructed as to provide a reservoir which could be built at a small expense, thus insuring ample water supply for irrigation throughout the year.

A trip through the municipalities of San Fernando, Mexico, Arayat, Candaba, San Luis, San Simon, Apalit, Macabebe, Masantol, Magalang, Mabalacat, Angeles, Porac, Bacolor, Sta. Rita, Guagua, Lubac and Floridablanca made during the month of September, 1908, revealed that agricultural conditions in Pampanga were quite prosperous. The principal products of the towns visited are sugar, rice, and corn, the cultivation of which, while hampered by the scarcity of work animals, was by no means neglected. It was gratifying to note the almost total absence of animal diseases, there being reported only an occasional case of *glosopeda*.

There are certain creeks in the province which would afford a bountiful supply of water for irrigation, thereby rendering possible a double harvest of rice where now only one crop is taken. Some of these as they now exist are destructive, since they overflow their banks and damage crops during the rainy season.

Upon the report of the prevalence of disease attacking coconut trees in the Province of La Laguna, the superintendent of agricultural extension work proceeded to the municipality of Nagcarlan throughout whose barrios there was discovered the existence of bud rot and a disease which manifests its presence by the appearing of black spots on the roots and trunks of the trees. The owners of the coconut groves were using as a remedy for bud rot a solution of vinegar by applying it to the bud after having cut away the infected part. This treatment gave little or no result.

The trees affected by the other disease above described were treated by cutting away the spots which appeared on them. The result was that the trees soon dried up and died.

Cutting down and burning all infected trees was recommended as a precaution against the spread of these diseases.

Information was received that rinderpest and other contagious animal diseases were fast spreading through Nueva Ecija on account of the negligence and carelessness of the people in disposing of sick and dead animals. When the report was investigated, in coöperation with the veterinary force, it was discovered that in the barrio of Baluarte of the municipality of Gapan, the apparent center of infection, the inhabitants not only made no attempt to isolate sick animals from healthy ones, but neglected to bury or otherwise dispose of dead animals. This matter was taken up with the executive officials and resulted in their adopting energetic and adequate measures to aid in preventing the spread of diseases.

An investigation was made of the agricultural conditions of Bataan in the month of December, 1908, during which it was observed that rice and sugar cane were the principal products, the former being harvested three times a year. More extensive cultivation of coconuts, cacao, coffee, and oranges was recommended on account of the adaptability of the sandy soil of the province to their production.

During the month of January, 1909, the specially organized provinces of Palawan and Siquijor were visited for the purpose of making a study of their products and the methods used in cultivating them.

It was learned that the principal agricultural product of Palawan is rice. However, the extensive virgin arable lands consisting of plains and highlands are very adaptable to raising sugar cane and corn. The greater portion of this land is used for pasturage. The number of cattle raised exceeds the local demand and an appreciable number is exported from that province annually.

The agricultural products of the Province of Agusan are chiefly hemp and coconuts. There are sections of the country well suited for the cultivation of rice, but this crop is harvested in very small quantities due to the scarcity of work animals with which to till the soil.

The soil of the subprovince of Siquijor is poor and stony, which renders its use for cultivation almost absolutely unprofitable. Rice is grown in some parts, but corn is the principal product of the island and forms the main article of food for the inhabitants.

The subprovince of Bukidnon is quite rich in the production of abaca, cacao, and coffee. An inspection of these crops in the *rancherías* of Tankalan, Maloko, Impasug, Malay-balay, and Sumilao disclosed the fact that the coffee and cacao trees were planted too closely together to yield the harvest which the fertility of the soil would otherwise afford. The attention of the farmers was called to this condition and they were advised to plant their trees at a distance of 4 meters, one from the other, instead of 2 meters as was their custom.

SPECIAL WORK.

During the year steps were taken to ascertain whether there exist or have existed amongst the farmers economic coöperative societies. To this end and in conjunction with other investigations a circular letter was addressed to all provincial governors. From the information received it would appear that no society of this kind has ever existed. There are, however, a number of societies of a quasi-coöperative character, such as one which owns and operates a steam rice mill and another a rice thrashing machine; both are located in the Province of Bulacan.

These societies are composed of a few farmers who established these machines in their localities, first, for the preparation of their own crops for market and, second, for the preparation of the crops of others by charging a toll.

Amongst the abaca planters of Mindanao there is an organization known as "The Davao Planters' Association" to which, it is understood, the majority of the planters belong. This association not only fosters and stimulates the cultivation of hemp but looks after and defends the interests of all its members, both individually and collectively.

The superintendent of agricultural extension work was delegated to represent the Bureau of Agriculture at the second annual meeting of the agricultural congress of Panay and Negros, held at Iloilo on January 30 and 31 and February 1, 1909. During the sessions of this congress the question of recommending to the Philippine Legislature the establishment of a corps of veterinarians and the purchase of foreign breeding animals was open for discussion. The Bureau's representative availed himself of this opportunity to inform the three hundred farmers and business men present of the successful results obtained by its veterinary force in combating animal diseases throughout the provinces. The congress was likewise advised that the Bureau of Agriculture owns animals carefully selected for breeding qualities, for improving the native breeds of animals.

EXHIBIT C.

REPORT OF MR. DAVID B. MACKIE ON RAT EXTERMINATION.

MANILA, *June 30, 1909.*

SIR: I have the honor to submit the following report pertaining to the investigation of rats in southern Luzon and their relation to the rice crop:

During the month of January letters were being received at the Bureau signed by presidents of municipalities stating that unless some preventive measures were adopted the entire rice crop would be a failure, owing to the devastation caused by rats. Urgent letters were received from the presidents of Pañgil, Province of Laguna; Calolbon, Catanduanes; subprovince of Albay; and Bacon and Juban, Province of Sorsogon.

Under instructions from the Director of Agriculture, I started on January 29 to investigate the condition of the rice crop in Pañgil, Laguna Province, arriving the same day in Santa Cruz. There the rice crop was in fine condition and I could see no evidence of inroads from rats. On Sunday, January 30, I proceeded to Pañgil and told the president that I had come in answer to his letter of the 21st to investigate the rat plague of which he had spoken. He then said that the rats were doing no damage to the crop in Pañgil but that damage was being done in the barrio of Matiquio on the other side of the lake.

The paddy fields of Pañgil are located on the border of the lake on very low land, and after a rain storm are more or less submerged, which tends to keep the rats out of them. The crop in this municipality was just beginning to ripen and to all appearance was a very good one.

On Monday morning, January 31, I crossed the lake to Matiquio. Here the conditions were unusual, the barrio being very small and the paddies, which were hardly more than 3 hectares in extent, containing clumps of bamboo which offered admirable nesting places for the rats. The rice crop was being harvested and there was ample evidence of destruction by this pest. Poisoned bait, consisting of rice boiled in water containing strychnine and afterward coated with a sugar sirup, was used. The next morning it was clear that the bait had been visited and partly eaten, but no dead rats were found.

On February 1, I returned to Santa Cruz and from there I visited the rice fields of Pagsanjan and other barrios, returning the following day to Manila.

On February 2 I received an order to proceed to Virac, Catanduanes, Province of Albay. Leaving Manila on the 5th, I arrived

at Albay on the 7th. From that time until the 15th I examined the rice fields of Albay, Daraga, and adjacent barrios. On the 15th I left Albay for Calolbon.

At Calolbon the crop seemed to be in good shape and although I set out a number of traps the first day in holes that the people said were inhabited by rats I was unable to secure any specimens. The next day, however, I secured in one of the barrios a pair of adults and a nest containing three young ones. The adults measured, respectively, 426 millimeters for the male and 397 millimeters for the female. The nest which was located in the top of a hollow post was composed of grass and contained three large young, a male and female of which were secured. This species is a uniform reddish gray on the back and lighter underneath and closely resembles, and probably is, the common house rat (*Mus norwegicus*). The next morning what is apparently another species was caught. This specimen was reddish gray on top and whitish underneath.

On February 21 I returned to Virac, and from then until March 4 I examined the paddies in the barrios of Antipolo, Santa Niña, Taytay, Cogon, San Vicente, and Cabugao. With the exception of Antipolo, which reported damage from ducks, the crops were generally good. At Antipolo I secured a specimen of these ducks, which are small brown ones with blackish bills. The breasts and underparts are of a uniform brown, the backs being almost black and the individual feathers being margined and tipped with lighter color.

On March 4 directions to proceed to Bacon, Sorsogon, were received. The same day I left Virac and proceeded to Legaspi and from there to Bacon. Arriving at Legaspi on the morning of the 5th, I went from there to Bacon on the 6th. Leaving Legaspi by prao at 7 a. m. we arrived in Bacon at 11 p. m., the delay being due to contrary winds and the capsizing of the boat. On Sunday, March 7 I examined the paddies for evidence of rats. There were some signs of them but upon closer examination most of the damage was found to have been the work of larvæ of a small moth which bore up the inside of the stalks and on reaching maturity gnaw their way out, causing the stalks to fall, thus giving the impression that it was the work of rats.

The larvæ, which vary from 13 to 17 millimeters in length, are of a transparent greenish color with a double row of lateral reddish brown spots. The head is dark red-brown. Two posterior segments have a row of eight small reddish dots extending laterally across the dorsal surface.

Traps were set for rats and three specimens of the same species as that taken at Calolbon were secured.

On March 24 I sailed for Virac, arriving there the following afternoon while the rice crop was being harvested. From March 26 until April 4 was spent in studying the crops in the different barrios of Virac.

On April 4 I started on a tour of the northern towns of Catanduanes for the purpose of obtaining reports on the crop and securing specimens of the reported plagues.

From April 5 to 17 I spent in Bato and its barrios. The people in this locality reported a good crop with little damage by rats. At the barrio of Baras I was told that ordinarily the rats do very little damage except in an unusually dry season. It was also stated that in the seasons of 1904 and 1905 there had been some damage done by rats, but this season there were present indications of a good crop.

As I journed northward signs of destruction by rodents became more manifest. At Tambognon, a barrio of Viga, a number of specimens were taken and reports of damage were received. These specimens were of the common large gray rat that had been taken before, probably *Mus norwegicus*. The *tenientes* of the barrios reported that more damage was being done by ducks than by rats. On April 21 I secured specimens of the former and believe them to be *Dendrocygan arcuata,* a small brown duck which is common throughout Luzon and adjacent islands.

I arrived at Viga on April 24. At this municipality the people were just harvesting the rice crop and there was evidence of considerable damage by birds and rats. Here I secured many specimens, the majority being of the large gray rat before described. I also secured a specimen of a small brown rat which I have never taken before. This specimen was an adult male and measured from tip of nose to tip of tail 240 millimeters, the body being 110 millimeters and the tail being 130 millimeters. This is probably an undescribed species and, I believe, rare as it was the only one taken on the entire trip. Here we also secured specimens of a larger duck, probably the *Anas luzonica.* This duck and the species taken at Tambognon were both present in great numbers, some of the flocks aggregating five or six hundred. They spent the day on the sand bars of the river, and at twilight would come into the rice fields where they would settle in bunches of four or five and commence feeding. They evidently came and went throughout the night, as often after midnight I could hear flocks passing over, making a loud whistling noise with their wings.

Much damage was also done by the rice finch (*Munia jugari*), a small brown and black finch with a bluish bill. These little pests do the most harm when the rice is in the milk. They feed during the day but are most destructive during the early dawn and at twilight. They are gregarious and settle on the stalks in thousands. In the barrio of Oco I saw one particularly large flock, which I should estimate contained two or three thousand. The natives erect mats on poles to frighten them off, but I do not believe that this method is very successful.

On May 29 I visited the barrio of Bagamanoc. Here I found rats more prevalent than in any other barrio. The rice crop had just been harvested and the rodents were extremely hungry. I set twelve traps baited with corn. Every night I would catch at least ten rats which in turn would be eaten by others. From this experience I should judge that after the rice is harvested would be the best time to deal with the pests, as they are suddenly robbed of most of their food supply and are very hungry. In this barrio I also secured a new specimen. This specimen was an adult pregnant female containing six young. The measurements were: total length 223 millimeters, body being 126 millimeters and tail 97 millimeters. It was gray on the dorsal region, shading to white on the ventral.

On June 4 I left Bagamanoc for Pandan. Here the president told me that owing to rats, birds, snakes, and lizards they had been unable to harvest a good rice crop for six years. In this municipality specimens of the same large gray rat were taken, but not in great numbers. Here the natives told me that since the rice crop had been harvested the rats had taken up their abode in the houses. There is much truth in that, for whenever I placed traps in the house I secured specimens of this variety. Here I also secured specimens of another species of rice finch, probably *Urolonca everetti,* that was doing considerable damage; also specimens of a weevil and a specimen of rice fungus.

On June 12 I visited Caramoan, a barrio of Pandan. Here they reported damage by rats, but stated that it was not extensive. On June 15, having completed the survey, I sailed for Virac, stopping en route at three other barrios which, however, raised very little rice and reported no damage. I arrived at Virac on June 18 and on the 22d sailed for Manila, arriving there on the 26th.

Respectfully submitted.

DAVID B. MACKIE.

DIRECTOR OF AGRICULTURE, *Manila.*

EXHIBIT D.

LEGISLATION AFFECTING CROP-REPORTING STATISTICS.

Act No. 1898, passed by the Legislature at its last session, will greatly assist in obtaining correct statistics. Under its terms it is now the duty of presidents of municipalities created under Act No. 82, a general Act for the organization of municipal governments in the Philippine Islands, to give quarterly returns of the animals and crops in their respective municipalities on blank forms to be furnished by the Director of Agriculture. The law provides that these shall be substantially the same as the monthly reports which have been in use up to the present time.

In the intervening months, for the purpose of keeping this Bureau in touch with agriculture conditions, the presidents will be asked to fill in a brief form reporting diseases of animals, any injury to crops from weather or pests, general condition of growing crops, and local prices of crops.

NEW STATISTICAL SYSTEM.

With the more accurate statistics which it is confidently expected will be obtained under the new law, it is proposed to inaugurate a card system for classifying in detail all the information received so that it may be readily available for reference. To this end the modern method of charts will be largely used, enabling a person at a glance to tell the status of crops or animals in any municipality for each quarter. Other charts will group the municipalities of each province together, so comparisons can readily be made between provinces. There will also be an insular chart.

COÖPERATION OF PRIVATE INDIVIDUALS.

At the present time about half the correspondents of this Bureau are municipal presidents and half private individuals. For the purpose of uniformity it is planned to send blanks to municipal presidents only, beginning with the monthly forms for July. Where, as in a large number of cases, private correspondents have given their time and in many instances gone to expense in collecting accurate information that has been highly appreciated by the Bureau, they should deem it no reflection upon the individual if the law-making authorities have deemed it best, looking over the whole situation, to have future reports drawn up by municipal presidents, who will not only be able to call upon all officials and employees working under them for information, but to make use of their clerical force in putting it into shape for transmittal.

It is hoped that the private correspondents of the past, many of whom have done such good work, will not relax their efforts but will coöperate with the presidents in their respective municipalities and put at their disposal the information they have formerly sent direct to this Bureau.

Exhibit E.

LEGISLATION AFFECTING TOBACCO BOUNTIES.

With a view to encourage small planters of tobacco to grow more marketable leaves per hectare; to sort it more uniformly as regards the size, quality, coloring, etc., of the leaves; and to cure it in the manner best suited for the manufacture of cigars, etc., Act No. 1767 became a law on October 11, 1907. This Act provided for bounties to be given in the Provinces of Cagayan, Isabela, and La Union each year to the tobacco planters who excelled in the above-named respects, and made available an annual expenditure of ₱5,000 in other tobacco-growing provinces under the direction of the Governor-General.

This law was first operative for the calendar year 1908. The committee appointed in the Province of Cagayan and the Province of Isabela gave very careful consideration to the question of the best methods for distributing prizes and in their report stated that it had been found that the grower of tobacco did not cure it for the market but sold it in *manos* to those who did; and, therefore, advised that no bounties be awarded to the third class mentioned in the law. It was also found that a very limited area in each province produced the best tobacco and it was therefore hopeless for planters in other districts to compete for a prize; so they advised that each province be divided up into not to exceed four districts with reference to the quality of tobacco grown. With no change in the amount of money to be distributed in a province this would result in much smaller prizes, but this was considered an actual advantage, eliminating any incentive to fraud. It was also found that certain administrative expenses were necessary in carrying out the law and they recommended that the amount of these be deducted from the bounty fund. The reports of the committee in Cagayan and Isabela were supplemented by a very comprehensive personal report of Mr. H. E. Stevens, the representative of this Bureau on both committees.

No planters qualified for the prize to be given to those growing and curing tobacco, but first, second, and third prizes were given to those growing the greatest number of leaves per hectare and to those packing the leaf most uniformly.

In the Province of La Union the committee appointed decided that the growers had not qualified for prizes through failure to conform to the terms under which they were to be given, so no prizes were awarded by the committee in this province.

By Executive Order the sum of ₱900 was set aside by the Governor-General for bounties in the Province of Iloílo, beginning with the calendar year 1909.

The committees to award tobacco bounties are composed of the provincial treasurer, a representative of the Bureau of Agriculture, and a third member chosen by the other two who must be a planter of or a dealer in tobacco.

The recommendations made by the committees in Cagayan and Isabela, the advantages of which were explained at length by Mr. Stevens, were heartily concurred in by this Bureau. The attention of the delegates to the Assembly from tobacco-growing provinces was invited to the correspondence and recommendations, resulting in the passage of Act No. 1917 amending Act No. 1767 along the lines recommended, and putting the administration of the bounties into the hands of the Director of Agriculture, subject to the approval of the Secretary of the Interior.

The law as amended makes the same amounts available for bounties as heretofore, omits the third class (those who both grow and cure tobacco for the market), divides provinces into not to exceed four districts under the supervision of the Director of Agriculture, subject to the approval of the Secretary of the Interior, and allows for administrative expenses from the general fund allotted to each province.

It is hoped that a large number of tobacco growers will make an effort to get a prize for which, under the amended law, all will stand upon an equality.

Exhibit F.

AGRICULTURAL EXPLORATION.

BUD ROT OF COCONUTS.

Upon advice that bud rot existed in Laguna and Tayabas, a general inspection was made of the coconut groves of these two provinces along the road between the towns of Lucena, Candelaria, Tiaong, San Pablo, and Nagcarlan. No disease was discovered until Nagcarlan was reached. Three days were spent in looking over the situation in this locality. Several infected

trees were found in the barrios of Lasaan, where the loss from bud rot had been considerable. The infected trees were also found in Pagsanjan and were cut down and their buds burned with oil.

It was decided, after this brief inspection, that a vigorous campaign should be inaugurated against the disease and steps taken to destroy, if possible, all diseased trees and burn infected buds with petroleum. Accordingly, Mr. A. F. Byars was detailed upon this work. He was assisted by Mr. Silverio Apostol and Mr. Victorino Borja, the party leaving for Santa Cruz on October 22 to being this work.

Previously a stringent, but very effective, ordinance for aid in the suppression of bud rot had been enacted by the provincial board of Laguna. A similar one was also passed in Tayabas. These ordinances made it obligatory upon owners or any persons in charge of coconut groves to report the presence of the disease on its first appearance to the municipal president, who is made inspector *ex officio* and whose duty it becomes to inspect said trees and order their owners to cut them down and burn the infected buds. Any person who becomes cognizant of the existence of coconut disease in any locality through observation or information and fails to report the same to the president, any president who neglects to inspect and order a diseased tree destroyed, or any owner who refuses to cut down or burn the infected portion of a diseased tree, becomes liable to a fine not to exceed ₱200 or to imprisonment not to exceed thirty days. A law of this kind is most necessary in combating an infectious disease like bud rot.

A close inspection of a number of barrios of Magdalena and Majayjay revealed no case of bud rot. Several active cases of bud rot were discovered in two barrios of Lilio, and in one of these about one hundred and fifty trees were cut down in one day. Almost every barrio of this town was inspected, other towns being worked in a similar manner.

After a little more than five weeks' work the party had given a detailed inspection to the eleven towns of the coconut region of Laguna. Active cases of bud rot were discovered in six of these. It is estimated that one district of Nagcarlan lost ten per cent of its coconut trees during the year.

Nineteen days were spent in inspecting towns of Tayabas going over from Majayjay to Lucban and working the coconut region on the Tayabas slope of Mount Banajao to Lucena on

the coast, south to Pagbilao, then from Lucena back to San Pablo, Laguna. But no conclusive evidence of bud rot was discovered in this territory. Thus a circle of inspection around the infected area was completed, outside of which no disease was found to exist.

While all trees showing symptoms of bud rot at the time of inspection were destroyed, it is quite probable that other trees previously infected by means of wind or insects may develop the disease later on. This calls for a close coöperation of provincial and municipal officials and growers of coconuts in a careful watch of the groves. Presidents of towns, *tenientes* of barrios, and owners of coconut groves have been informed as to the nature of the disease and the manner of its extermination. Much depends upon their efforts along lines indicated to control this disease which, if left alone, may destroy vast coconut wealth.

In connection with the special work on bud rot in Laguna and Tayabas, observations were taken upon the general agricultural conditions in both provinces. Agricultural maps (copies with corrections) were made of the towns of Santa Cruz, Pagsanjan, and Lucena. A collection of ninety-seven agricultural specimens was secured, including plants, insects, and forty-six (?) native varieties of rice. Also all possible data concerning the coconut industry was gathered, such as the cost of the production of nuts and the manufacture of copra, oil, and alcoholic beverages.

In January an inspection trip of nine days was made in Pangasinan and Tarlac especially in the interests of rice and coconuts. In the six towns of Pangasinan visited the coconut groves were in a healthy condition as regards disease and insect enemies, the damage from ravages of the rhinocerous beetle being exceptionally slight. They were not bearing very freely as a result of the baguios a few months previous and the dry weather prevailing at that time. The soil of Pangasinan is well adapted to the production of coconuts and there are good prospects for the development of this industry. In the vicinity of San Fabian young groves come into bearing at a very early age. Samples of more than fifty kinds of native rice were secured in the town of Tarlac.

During the two weeks following March 6, 1909, an inspection was made of the coconuts on the Island of Marinduque. While the climate and soil is suited to successful growth of coconuts, very poor methods of planting are practiced and the loss

entailed from the ravages of the coconut beetle, which kills large numbers of trees, is very great in this subprovince. Nowhere else do the crows seem to be so great a pest; they are especially destructive to the young nuts of the coconut. It was recommended that they be killed by use of poisoned bait. Marinduque was found to be rich in natural resources, the soil being adapted to the growth of a great number of crops. An agricultural map was prepared showing the general distribution of the most important crops and a report upon existing agricultural conditions, with recommendations for more improved methods of cultivation, which was turned over to the subgovernor for dissemination among the farmers.

Beginning March 22, 1909, inspection was made of the three largest islands of the Romblon group—Romblon, Sibuyan, and Tablas.

Practically the whole cultivated area of the Island of Romblon is planted to coconuts. Great damage was done to groves by the terrific baguios that swept this island on September 23 and December 5, 1908. It is estimated that fully 7 per cent of the trees were destroyed outright, uprooted, or snapped off. Production of crops was stopped for six months, while a large number of trees were so nearly denuded of foliage that at least two years will be required for their complete recovery. It was noticed that the loss was greatest among those groves in which close planting and notching of trees was practiced.

On the Island of Sibuyan small crops of coconuts, rice, abaca, and corn are grown; but by far the most important industry is that of stock raising. Plenty of good grazing and a bountiful supply of fresh water is afforded and as yet no infectious animal diseases, such as rinderpest or surra, have visited Sibuyan. Tablas is very similar to Sibuyan, excepting that it is more densely populated and larger areas are planted to corn, coconuts, rice, and tobacco.

A number of agricultural specimens were collected in these islands and brought to Manila.

ORANGES.

At the request of the governor of Batangas, an investigation was made of the orange district of Batangas. The Assistant Director of Agriculture and an agricultural explorer, Mr. Guzner, made a trip through the principal part of the orange-growing section with the idea of ascertaining, if possible, some

way by which the market season of oranges grown in this district could be prolonged, and the quality of the oranges improved. The investigation showed that practically all of the oranges grown in this district are seedlings of varieties known locally as *Naranjita* and *Cajel*. The *Naranjita* predominates, probably because the yield is heavier. The *Naranjita* is a loose-skinned orange of rather larger type than the Japanese tamarind but has a very poor flavor and low density of juice. The seedling trees of this variety grow very tall and make it rather difficult to harvest the fruit. The height of the tree and the quality of the fruit also could be largely improved by selecting the varieties and budding on to grape fruit or wild orange stock.

The *Cajel* is a large round orange resembling in shape the ordinary Florida seedling. Frequently individual specimens are found of fairly good flavor. Were the tree a good bearer this orange would be worth propagating more extensively. No evidence was found of anyone's having attempted to grow the better foreign varieties, neither was there found any evidence of any attempts to propagate by budding or grafting from any of the better trees of the native variety. All groves are propagated by planting the seed in a nursery and transplanting as soon as the young trees are large enough.

The oranges all ripen at practically the same time, hence the market season is short. Little or no cultivation is given to the groves, many of them being allowed to grow up in weeds, bushes, bananas, etc., which tends to sap the life of the trees and reduce the quality of the fruit produced. Insects and disease seem to be quite prevalent, causing considerable damage to the trees.

On March 5, Mr. M. Cruz, a returned *pensionado* student, and an agricultural explorer, made a second trip to Batangas with the idea of holding meetings among the orange growers and talking to them about the value of giving their trees better cultivation and using some judgment in selecting the better varieties for propagation. Practically every barrio of the district was visited during the two weeks' trip and personal instructions given to most of the growers along the lines mentioned above.

The Bureau at present has no expert in citrus fruit growing but it is hoped that in the near future one can be obtained and a small demonstration station can be started in this district where the people can be taught by observation how to handle their trees in order to obtain the best results. This matter was taken up informally with some of the larger growers and they indicated a willingness to place land at the disposal of the Bureau

for any length of time desired in case it would be used for this purpose. The funds available at this time, however, are not sufficient to carry out this project in the immediate future.

RICE.

Three of the Filipino students recently returned from the United States have been detailed on the work of collecting data relating to rice growing in these Islands, with the idea of collecting samples of the better varieties and making comparative tests at one of the experiment stations.

During the year the names of 2,430 different varieties have been obtained and 828 different specimens have been collected from 30 provinces. Out of these, 200 so-called varieties of lowland rice and 56 of upland rice were selected for comparative tests. They were planted in seed beds on low rice land at Alabang stock farm, about June 20. Irrigation water was supplied in order that the plants might not suffer for water at any time during the growing season. It is hoped by careful comparison to eliminate all duplicate varieties. After varieties have been identified in this manner, seed of those most promising will be secured from the original source, namely, the province in which the seed was first obtained, and grown in more extended areas for further comparisons. In the meantime, the collection of different varieties will be continued at harvest time until the entire Islands have been covered and samples of all so-called varieties obtained.

EXHIBIT G.

STATISTICS RELATING TO DISEASES OF THE ISLANDS.

[Compiled from weekly reports of veterinarians and inoculators.]

Disease.	Number of provinces and subprovinces reported from.	Number of animals affected.	Approximate number of animals exposed.	Number of deaths.	Number killed.
Rinderpest	34	8,605	109,089	6,128	15
Surra	18	779	12,438	497	329
Glanders	18	312	1,179	56	48
Foot-and-mouth disease	23	10,673	1,487	125	----------
Lymphangitis	10	100	75	9	----------
Septicemia	5	57	2,122	18	----------
Hog cholera	4	67	960	68	----------

EXHIBIT H.

TABLES SHOWING THE NUMBER, KIND, AND CONDITION OF CATTLE ARRIVING IN MANILA DURING THE YEAR.

Cattle and carabaos free from disease arriving in Manila from foreign ports, prior to November 2, 1908.

Date of arrival.	Port of embarkation.	Number of animals.	
		Cattle.	Carabaos.
July 6, 1908	Barcelona	1	
July 11, 1908	Australia	4	
July 22, 1908	Phuyen	994	
Do	Australia	4	
July 25, 1908	Quin Hon	146	62
August 5, 1908	Phuyen	928	70
August 6, 1908	Hay How	260	
August 7, 1908	Camh Ranh	60	84
August 9, 1908	Australia	10	
August 17, 1908	do	10	
August 18, 1908	Quinhon	209	24
August 24, 1908	Pnom Pehn	745	125
September 2, 1908	Camh Ranh	304	71
September 5, 1908	Phuyen	849	125
September 10, 1908	Quin Hon	505	145
September 14, 1908	Saigon and Quinhon	225	32
September 20, 1908	Camh Ranh	67	75
September 22, 1908	Compong Thaches	802	114
September 28, 1908	Phuyen	520	22
September 29, 1908	Australia	8	
Do	Phuyen	12	
September 30, 1908	do	5	
October 4, 1908	Na Thrang	265	103
October 7, 1908	Hongkong	29	
October 10, 1908	Phuyen	619	48
October 12, 1908	Compong Thaches	763	145
October 17, 1908	Phuyen	529	75
October 27, 1908	do	617	56
Do	Hongkong	24	
October 30, 1908	Na Thrang	738	48
November 1, 1908	Australia	2	
	Total	10,254	1,424

Cattle and carabaos arriving in Manila from foreign ports, prior to November 2, 1908, found infected but landed.

Date of arrival.	Port of embarkation.	Number of animals.		Disease.
		Cattle.	Carabaos.	
July 6, 1908	Hongkong	190		"Glosopeda."
Do	do	70		Do.
July 9, 1908	Pnom Pehn	693	109	Do.
July 10, 1908	Hongkong	226		Do.
August 31, 1908	Hai How	300		Rinderpest.
September 28, 1908	do	137		Do.
October 19, 1908	do	600		Do.
	Total	2,216	109	

Cattle and carabaos free from diseases arriving in Manila from foreign ports subsequent to November 2, 1908.

Date of arrival.	Port of embarkation.	Number of animals.	
		Cattle.	Carabaos.
November 2, 1908	Hongkong	50	
Do	Compong Thaches	452	120
November 8, 1908	Phuyen	667	46
November 14, 1908	Camh Ranh	432	103
November 23, 1908	Phuyen	760	24
November 26, 1908	Compong Thaches	589	72
December 1, 1908	Hongkong	79	
December 5, 1908	Phuyen	650	89
December 18, 1908	Hongkong	60	
Do	Phuyen	729	34
December 20, 1908	Quin Hon	474	191
December 29, 1908	Hongkong	65	
January 1, 1909	Australia	9	
January 10, 1909	Singapore	4	
January 12 1909	Hongkong	69	
January 19, 1909	Phuyen	1,056	
February 4, 1909	Hongkong	94	
February 8, 1909	do	109	
February 9, 1909	do	94	
February 11, 1909	Pnom Pehn	706	
Do	Na Thrang	352	114
February 23, 1909	Phuyen	344	120
March 2, 1909	Hongkong	99	
March 5, 1909	do	124	
March 9, 1909	do	229	
March 12, 1909	do	259	
March 16, 1909	do	194	
Do	Australia	24	
March 17, 1909	do	10	
March 29, 1909	Hongkong	121	
April 9, 1909	do	227	
April 12, 1909	Pnom Pehn	140	281
April 20, 1909	Hongkong	129	
April 26, 1909	do	89	
April 28, 1909	Pnom Pehn	530	30
May 4, 1909	Hongkong	179	
May 7, 1908	Singapore	7	
May 9, 1908	Australia	4	
May 17, 1908	Pnom Phen	439	100
June 1, 1908	do	590	80
June 7, 1908	Australia	2	
June 22, 1908	Pnom Phen	302	120
	Total	11,542	1,524

Cattle arriving in Manila from foreign ports, subsequent to November 2, 1908, in good condition but considered infected before arrival.

Date of arrival.	Port of embarkation.	Number of cattle.	Date of first symptoms.	Disease.
November 10, 1908	Hongkong	58	Nov. 13, 1908	"Glosopeda."
December 1, 1908	do	117	Dec. 4, 1908	Do.
January 8, 1909	do	60	Jan. 11, 1909	Do.
January 18, 1909	do	100	Jan. 20, 1909	Do.
January 25, 1909	do	131	Jan. 28, 1909	Do.
February 15, 1909	do	125	Feb. 16, 1909	Do.
February 19, 1909	do	124	Feb. 20, 1909	Do.
March 13, 1909	do	307	Mar. 15, 1909	Do.
March 15, 1909	do	150	Mar. 18, 1909	Do.
	Total	1,172		

Cattle and carabaos arriving in Manila from foreign ports, subsequent to November 2, 1908, found infected—Held on lighter in bay for immediate slaughter.

Date of arrival.	Port of embarkation.	Number of animals.		Disease.
		Cattle.	Carabaos.	
October 31, 1908	Hongkong	54		"Glosopeda."
November 6, 1908	do	79		Do.
November 9, 1908	do	99		Do.
November 13, 1908	do	104		Do.
November 16, 1908	do	121		Do.
November 17, 1908	do	113		Rinderpest.
November 21, 1908	do	116		Do.
November 25, 1908	do	108		"Glosopeda."
Do	do	38		Do.
November 28, 1908	do	119		"Glosopeda" and rinderpest.
December 2, 1908	Anpin, Formosa	184	14	Rinderpest.
December 5, 1908	Hongkong	142		"Glosopeda."
December 7, 1908	do	113		Do.
December 9, 1908	do	127		Do.
December 12, 1908	do	140		Do.
December 13, 1908	do	306		Do.
December 14, 1908	do	90		Do.
December 15, 1908	do	130		Do.
December 21, 1908	do	60		Do.
December 22, 1908	do	60		Do.
December 26, 1908	do	66		Do.
December 29, 1908	do	150		Do.
January 1, 1909	do	180		Do.
Do	Tuaruane	540	65	"Glosopeda" carried on infected ship.
January 4, 1909	Hongkong	105		"Glosopeda."
January 5, 1909	do	157		Do.
January 15, 1909	do	238		Do.
January 19, 1909	do	113		Do.
January 23, 1909	do	90		Do.
January 25, 1909	do	85		Do.
January 29, 1909	do	85		Do.
February 2, 1909	do	139		Do.
February 5, 1909	do	56		Do.
February 12, 1909	do	178		Do.
February 16, 1909	do	158		Do.
February 21, 1909	do	288		Do.
February 25, 1909	do	120		Rinderpest.
February 26, 1909	do	170		"Glosopeda."
February 27, 1909	do	51		Do.
March 4, 1909	do	93		Do.
March 19, 1909	do	142		Do.
March 22, 1909	do	175		"Glosopeda" and rinderpest.
March 23, 1909	do	146		Do.
March 26, 1909	do	147		Rinderpest and "glosopeda."
March 29, 1909	do	118		Rinderpest.
April 2, 1909	do	126		Do.
April 3, 1909	do	306		Do.
April 5, 1909	do	123		Do.
Do	do	131		Do.
April 11, 1909	do	405		Do.
April 12, 1909	do	150		Do.
April 16, 1909	do	100		Do.
April 20, 1909	do	205		Do.
April 27, 1909	do	110		"Glosopeda."
April 30, 1909	do	150		Do.
May 7, 1909	do	174		Rinderpest.
May 9, 1909	do	425		"Glosopoda."
May 11, 1909	do	100		Do.
May 13, 1909	do	100		Do.
May 14, 1909	do	100		Do.
May 18, 1909	do	12		Rinderpest.
May 20, 1909	do	399		Do.
May 21, 1909	do	50		Rinderpest and "glosopeda."
May 24, 1909	do	50		"Glosopeda."
May 25, 1909	do	50		Do.
June 1, 1909	do	50		Do.

Cattle and carabaos arriving in Manila from foreign ports, etc.—Continued.

Date of arrival.	Port of embarkation.	Number of animals.		Disease.
		Cattle.	Carabaos.	
June 7, 1909	Hongkong	100		"Glosopeda."
June 8, 1909	do	103		Do.
June 11, 1909	do	200		"Glosopeda" and rinderpest.
June 12, 1909	do	210		Rinderpest.
June 14, 1909	do	139		Do.
June 15, 1909	do	137		Rinderpest and "glosopeda."
June 19, 1909	do	152		Do.
June 21, 1909	do	113		"Glosopeda."
June 22, 1909	do	87		Exposed "glosopeda."
June 26, 1909	do	164		"Glosopeda."
June 28, 1909	do	116		Do.
June 29, 1909	do	141		Do.
	Total	11,073	79	

EXHIBIT I.

Tabular statement of inspection of the port and city of Manila, ending June 30, 1909.

Kind of animals.	Inspected.		Inspected without fees.	Rate per head.	Amount.	Shipped to provinces.
	From foreign ports.	From Philippine ports.				
Cattle	36,298	2,165	39	₱0.20	₱7,684.80	9,241
Carabaos	3,136	1,421	1	.40	1,822.40	3,598
Horses	1,548	1,565	1,065	1.00	2,048.00	653
Hogs	56	54,542	3	.10	5,459.50	226
Sheep	3	151		.20	30.80	27
Goats	4	733	17	.20	144.00	57
Other animals	262	495	175	.40	232.80	41
Total	41,162	61,217	1,300		17,422.30	13,843

EXHIBIT J.

Inspection and condemnation at abattoir.

Kind of animals.	Inspected.		Condemned.		Rejected.	Parts condemned.
	Ante-mortem.	Post-mortem.	Ante-mortem.	Post-mortem.		
Cattle	31,180	28,379	101	4	144	29,789
Hogs	61,701	60,789	15	910	5	55,392
Sheep	16	16				14
Goats	1,040	16				1,168
Deer	1	1				1
Total	93,939	90,225	117	914	149	86,364

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ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
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The Philippine Agricultural Review, Manila, P. I.

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Boletin de la Cámara de Comercio Filipina, Manila, P. I.
Revista Agrícola é Industrial, Manila.
Boletin Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Cuba.
Boletin de Agricultura, San José, Costa Rica.
Hacendado Mexicano, El, Mexico, Mexico.
Hacienda, La, Buffalo, New York.
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OTHER LANGUAGES.

Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
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Boletim do Museu Goeldi, Para, Brazil.
O Fazendeiro, Sao Paolo, Brazúl.
Boletim de Sociedade de Geographia de Lisboa, Portugal.

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No. 14. The Cultivation of Sesamum in the Philippine Islands. (Spanish.)
No. 15. Tobacco Growing in the Philippines. (Spanish.)

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POPULAR BULLETINS.

No. 1. Maguey. (English, Spanish, Visayan, Cebuano.)
No. 2. Kapok. (English, Spanish, Tagalog, Visayan, Ilocano, Cebuano.)

HIS EXCELLENCY, OUR GOVERNOR-GENERAL, WILLIAM CAMERON FORBES.

THE PHILIPPINE

Agricultural Review

VOL. III FEBRUARY, 1910 No. 2

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ILLUSTRATION.

His Excellency, our Governor-General, William Cameron Forbes ..... Frontispiece.

EDITORIAL.

PROGRESS THE WATCHWORD.

In this number of the REVIEW we are glad to record so many events which mark the beginning of a new era in the Philippines—the success of the efforts of the Insular Government in the Islands.

In the first place we desire to call attention to the inaugural address of Governor-General William Cameron Forbes, extracts from which will be found on the following pages. In this address the Governor-General speaks in very plain terms of the purpose of the United States Government in these Islands, of the needs of the people and the country—the protection of their health, education, highways, rivers and harbors, railroads, the ownership of land, irrigation works, post-offices, post-roads, telegraphs, and the general prosperity of the country—in a manner that should inspire the confidence of Filipinos and Americans alike. There is no uncertain statement or uncertain tone in any part of this address.

In outlining the future progress of the country we see the Government has made regulations providing for the free admission into the United States of Philippine products under the provisions of the new tariff law; the selection of a prominent veterinarian in the United States as chief veterinarian of the Bureau of Agriculture for the purpose of stamping out the infectious animal diseases in the Islands which have been the greatest obstacle to the actual progress of the country; the executive order regarding labor contracts for the protection of the farmer and employer providing a penalty for the breach of a labor contract; and in the provinces we see the plan of the provincial board of Leyte for fighting the locust and grasshopper pest. The reader will see that the Government has not forgotten to give preference to the small farmers, growers, and producers in order to secure for the poorest man the largest opportunity and the greatest profits possible. All of these movements are for the assistance and protection of the interests of those engaged in various business enterprises and in the development of the natural resources of the country.

On the other hand, in the actual growth and progress of the country we see the tobacco bounties which have been awarded by the Government to the growers in the leading tobacco districts of the Islands to stimulate the growing of a better quality and a larger quantity of tobacco leaf on a given area of land; the purchase by the Havemeyer Company of the San

José friar land estate, which will be turned into a model sugar plantation where sugar growing and possibly sugar refining will be carried on in the most up-to-date manner that is known to the sugar manufacturers of the world; the annual report of the treasurer of the Moro Province which marks steady and substantial progress in the second largest island in the Archipelago; the Philippine Carnival has been more than ever before an industrial exhibition which represents the possibilities of the industries, manufactures, and trade of the country.

In consequence of such progress in the Islands we see the agents of the other countries such as Hawaii, Japan, China, Java, and Australia visiting the Philippines to investigate our conditions and to look after their share of the growing trade of this country; we see the great trans-Pacific steamship companies arranging to make Manila a port of call for their steamers to the Far East. In addition to these movements we see the organization in the United States and the Philippines, as a consequence of the opening of the United States market to the products of the Philippines, of a large and strong company to look after and guard the interests of the producers of Philippine products under a just and fair competition with the products of the United States that the people of the Philippine Islands may enjoy the largest possible benefits of the open market for their products in the United States. Finally we invite the attention of our readers to the recommendations of the Philippine Commission to the Secretary of War which if approved, will, we believe, give to everyone, Filipinos, Americans, and all engaged in legitimate business, as large opportunities as there are in any State or country in the world for business success, for the building up of large business enterprises, and the making for themselves independent fortunes equal to those of the citizens of any country in the world—*the new era.*

EXTRACTS FROM THE INAUGURAL ADDRESS OF GOVERNOR-GENERAL WILLIAM CAMERON FORBES.

OUR PURPOSE.

Analyzing the instructions of President McKinley, we may fairly take as the goal toward which we are to steer, the happiness, peace, and prosperity of the Philippine people. In so far as the people are to-day happy, peaceful, and prosperous we have succeeded; in so far as the people do not enjoy these blessings, we have not yet achieved success. The people are to-day peaceful. We can concentrate our attention in bringing them prosperity, secure in the belief that under just and equitable laws, under a wise and firm government, with that freedom of thought, of speech, of worship, of labor, and of opportunity which now prevail, happiness will not be found far away when the means of procuring it are abundantly at hand.

Here is a climate particularly favorable for some classes of products and capable of yielding vast returns to honest and intelligent expenditure of effort, and yet here we have a people bemoaning their poverty and living from day to day without those reserve supplies so necessary where crops are uncertain, without the alleviation from suffering which modern medicines and surgery can give, without the nourishing kinds of food so necessary to build up the strength of the body, without houses built to withstand the elements, without, in fact, most of those things which modern civilization believes to be necessary for the happiness of a community.

An analysis of the fundamental conditions of life reveals in part the reasons for these conditions. A very large proportion of the people have been held in that primitive condition where each man supplied all of the things necessary for his own use and got along with only what he could personally produce. *We must bend our efforts to advance the day when each individual supplies the articles which he is best fitted to produce, which he sells to his fellow-men, and uses the money thus gained to*

purchase of others the things which they can produce better and cheaper than he. This is the essence of trade, and this condition of affairs is impossible without economical and adequate means of transportation, hitherto woefully lacking.

CAPITAL NEEDED.

Our success in accomplishing our principal object in these Islands, namely, that of bettering the condition of the people, may be best measured by the increase from time to time in the rate of wages and in the value of imports and exports.

Let us turn our attention to a few comparative figures. The total population of Hawaii is 198,000 people, or about one-fortieth part of the population of the Philippine Islands, now approximately eight millions. The total exports from Hawaii in 1907 were $29,000,000, the total exports from the Philippine Islands for the same year were $34,000,000. In other words, Hawaii produced for export approximately thirty-six times as much per capita as did the Philippine Islands. This is not because their laborers are superior, as Hawaii has come here in search of laborers and reports that those few whom they have obtained are equal to their Japanese, Korean, and other laborers.

Porto Rico has 1,000,000 people, or one-eighth the population of the Philippine Islands, and in 1907 its exports were $27,000,000. Porto Rico evidently does not exercise the same degree of economy in the use of its labor as does Hawaii, for it produces only one-sixth as much per capita for export, and still Porto Rico exports six times as much per capita as do the people of the Philippine Islands. Were these Islands to produce for sale to other countries as much per capita as Porto Rico the total exports would be $216,000,000. Were they to produce as much per capita as Hawaii the total exports would be $1,179,000,000 a year.

The explanation of this lies in the fact that Hawaii has an abundance of capital, employs modern methods of cultivation and manufacture, modern freight-handling devices, and suitable and adequate steamship and railroad facilities. In other words, in Hawaii the work of the laborer counts, in the Philippine Islands it does not. No, it is not labor that is wanted here, it is capital. Many Filipinos have a tendency to oppose the introduction of capital into these Islands, either from the United States or from foreign countries, fearing lest somehow it should militate against the realization of their aspirations. In my judgment it will have the opposite effect. It is true that it

might be possible in the course of several generations to develop the latent resources of the Philippine Islands without the assistance of outside capital and finally to accumulate enough to develop the domestic business from within. But why wait? We had better attract for our use the accumulations of wealth already made in other countries, sure that the advantages which flow from them will far more than offset any possible disadvantage due to the fact that some of the profits will leave the country or that the owners of the capital will endeavor to influence the administration of the Islands or their political status.

Capital demands a stable government. Capital is not particularly interested in the color or design of the flag. It wants just and equitable laws, sound and uniform policy on the part of the government, just and fair treatment in the courts. The faith of the United States is pledged that all of these benefits shall be permanently assured to the Filipinos. No capitalist need feel alarmed as to the security of his investment provided it has been made in such a way as to fulfill the conditions imposed by law. The United States stands pledged to the establishment and maintenance of a stable government in the Philippine Islands, not for the sake of such capital as may be invested here only, but for the sake of the welfare of the Philippine people and of the good faith of the United States before the world. The security of foreign capital is merely an incident in the general security of property and other rights to the Filipino, and both are now permanently assured. It would be good general policy for us to offer every reasonable inducement to capital to come, and with that end in view, to liberalize our land and mining laws and lessen the restrictions which have hitherto tended to discourage investors. My policy will be to hold out the hand of welcome to all people desiring to engage in legitimate enterprise.

The passage of the Payne Bill should give a new lease of life to the Philippine Islands. It assures us of the best market in the world for our products, a market that is not open to our neighbors, and therefore gives the Philippine Islands a preference which should enable us to increase very greatly the production of certain of our staples. This will have a vivifying effect which will be felt throughout the length and breadth of these Islands and awaken new hope in the hearts of the people who have been struggling against almost overwhelming difficulties.

MEANS OF TRANSPORTATION.

Railroads.—It is part of our programme to push to early completion a general and systematic improvement of the means of transportation. The existing contracts for railroads aggregate nearly a thousand miles, of which half are now built. This in itself is earnest of the beginning of the new era and will provide adequate transportation for a large proportion of the people.

Rivers and harbors.—The Government should bend its efforts toward the development of the rivers and harbors—a potential means of transportation which should equal in importance the facilities supplied by the railroads. We have more than a hundred rivers navigable within but closed at the mouth to the entrance of seagoing vessels by reason of the bars formed by the action of the waves at the shore. Especial attention should be given to the dredging of these bars and the building of bulkheads and scourways to render these natural highways available for the use and development of the Islands, and the Government should not rest until both sides of every one of these navigable rivers are lined from end to end with farms occupied and worked by prosperous and happy people.

Highways.—More important still, and supplementary to all of these, are the roads, and in the present progress of the work in connection with roads, I find the most happy augury for the future success of the Philippine people. In December, 1907, the Commission, until then the sole legislative body of the Islands, adjourned without passing any law making adequate provision for the necessary construction and annual maintenance of roads. I am glad to credit the members of the Assembly with having taken the most advanced and enlightened interest in the work and having made the most liberal provision for roads by voting funds for that purpose to the limit of the capacity of the treasury. Before the Legislature had convened the Commission had passed a law making a majority of the provincial boards elective, a measure which provided for the extension of autonomy to the provinces in line with the instructions of Presidents McKinley and Roosevelt and the policy of the American Government here. The success of the road movement depended upon getting the provincial board to pass a law each year increasing the amount of the cedula or poll tax from ₱1 to ₱2. To do this it is necessary to convince the provincial officials each year of the necessity of road construction and maintenance for their own present development and future

welfare. How nobly these officers have responded is demonstrated by the fact that the first year 27 of the 31, the second year 30, and the third year 31, or all of the provinces affected, have adopted the double cedula tax and put themselves in the line of advancement.

PUBLIC HEALTH.

The Filipinos are not strong enough to do the work which is required of able-bodied people. Examinations made by the sanitary authorities reveal the fact that in the regions inspected, which may be taken as fairly representative, by far the greater majority of the people are afflicted with more than one form of intestinal parasite, which sap the vitality and lessen the power to do work and the power of resisting disease. The most fruitful sources of these parasites are the polluted surface waters which the people have been accustomed to drink. A supply of pure potable water is the first requisite for the purpose of sanitation. To this end the most important agency is that of the artesian wells, which should be bored in every municipality and barrio in the Islands. Fortunately, the people themselves are most keenly alive to this necessity, and there has been no difficulty in getting a vote of the Philippine representatives of the different entities of government—Insular, provincial, and municipal—in favor of this most vital and important work.

Another direction in which the energy of the Government can be profitably employed is in checking the infant mortality, which continues at a most alarming rate. Care of infants will result in an increase in the numbers of the population and in the physique of the children, which can not fail to be most beneficial to the Islands.

OWNERSHIP OF LAND.

There is no agency more potent in creating good citizenship than is the ownership of land. It is necessary that the owners of land should be provided with registered titles, to use as security for loans or that they may be able to sell without there being the probability that the purchaser has acquired only a lawsuit. It is my purpose to provide for a complete survey of all the parcels of land in each municipality. I should like to so arrange matters that a judge of the Court of Land Registration may be at hand to fix the ownership to each parcel as surveyed, and when fixed the Government will give title to the land on the basis of division of expense of the same, the owner repaying somewhere from 60 to 80 per cent of the cost, in easy installments. This will save much of the traveling of surveyors

and greatly reduce the cost. The Agricultural Bank and Postal Savings Bank will then be able to make advantageous loans and greatly assist agriculture.

It is my intention to make the appointments to the vacant authorized positions in the Court of Land Registration in the near future.

The Government will adopt the policy of not entering objections to the issue of titles to land to its occupants where it is clear that the interest of the public will not suffer. I believe that these measures will end the present stagnant condition in the matter of land registration.

IRRIGATION WORK.

In the matter of irrigation, it is the plan of the Government to continue the active work of surveys and the gathering of data until we have a complete irrigation survey of the Islands and know each area capable of irrigation, the flow of each river, even at the driest times, the works necessary for its control in time of floods, the cost of the intended irrigation works, and the cost per hectare of putting water on the land to be improved. Having due regard to distributing the benefits from the irrigation works so as not to concentrate them all in one province or island, it is the policy of the Government to develop those areas first where the cost of the construction of the system per hectare is least. It is expected to collect from the land benefited the cost of maintenance of the system, the interest on the money invested, and something besides, which is to be added to the original fund, and which, with the continuing annual appropriation of ₱750,000 voted by the Legislature, should roll up into a sum which will, in the course of time, supply the Islands with irrigation systems wherever it can be done with profit.

POST-OFFICES, POST-ROADS, AND TELEGRAPHS.

The establishment of post-offices and extension of the rural delivery of letters should be continued as fast as funds will permit, until at least every municipality has its post-office.

It is hoped to establish and maintain wire or wireless telegraphic communication with every provincial capital, and to extend the system of telephone connection between the municipalities throughout the provinces. The general dissemination of knowledge as to prices, movements of ships, availability of cargo, and so forth, is of the greatest importance in stimulating production.

EDUCATION.

I want to see emphasis laid upon the importance of the practical side of industrial and agricultural education. Success in agriculture and industry are the things sought, and they can be best taught, and one might say only taught, by those who have themselves achieved success. Our agricultural schools should be made self-supporting, so that their products should pay the cost of the labor which is done on them, and something more.

I should like to see every one of the two million children of school age in these Islands receiving an education. The thought is grievous that any boy or girl in the Philippine Islands wanting to get an education should be unable to do so because of failure of the Government to provide facilities, and yet the resources of the Islands have not developed to a point where I feel that we are justified in largely increasing the appropriation for education. When the time comes that facilities can be available, I shall not be opposed to a law providing for compulsory education. The amount of education we shall be able to accomplish in ten years will be very much greater if we devote our first money toward increasing the wealth of the people and later use the resulting increase of revenue for extending our educational facilities. I liken the work of the Government on irrigation and improvement of transportation to cutting the strings which close the mouth of a purse of gold. The gold will pour forth and yield enough for all.

It is my hope that the Philippines University will soon establish, among other technical schools, a school of engineering, so that the important work of building up the public works of these Islands may be placed gradually in the hands of Filipinos.

The Filipino is as quick as any person to indulge in desirable and health-giving forms of amusement. Nothing could be better for the Filipino than stimulating his interest in wholesome outdoor sports, to develop the body and divert the mind. In the large cities of the United States it is a well-known fact that crime decreases in the neighborhood of playgrounds for children, and I hope the time is not far distant when every city in the Philippine Islands will maintain a plaza where children and young men and women can indulge themselves in healthy outdoor recreation. A strong body is earnest of a mind ready to work and to endure, and the young men and women of the Philippine Islands should make it a matter of pride to have broad and deep chests, finely developed muscles, and hands inured to toil.

FINANCIAL PROSPERITY.

Financially the condition of the Insular Treasury has been most satisfactory. We have had a reasonable surplus and rate of expenditure for current expense which has left a comfortable margin, some of which has been available each year for the construction of public works out of the current revenues. Although many people have got into the habit of complaining that the rate of taxation is high, and there has been a good deal of political agitation in favor of lower taxes, a study of comparative figures reveals the fact that the rate of taxation in the Philippine Islands, compared with that of other countries similarly situated, is extremely low, and the Filipino who questions the ability of his people to pay the low rate of taxation now imposed shows a great lack of confidence in their capacity.

The rinderpest is now the greatest menace to material development. The draft animals must be saved to the farmer, otherwise he can neither cultivate the land nor haul his products to market. The method of immunization is now known. The control of this disease is now a question of money and organization and I have already taken measures to remedy the deficiencies that have existed and shall allow no stone to remain unturned until this effort is crowned with success.

The destruction caused by locusts can be greatly lessened in my judgment by a system of rewards to be given for information brought of the places where the eggs are laid and, under provision of existing law, turning out the populace to destroy these or the young locusts before they have reached the age when they can fly.

The arm of the Government will be strongly used to reach out and find and punish those captains of steamers who refuse to carry a consignment of goods so that they may buy it at less than its value. The hand of the Government will be heavily laid on those officials, Insular, provincial, or municipal, who use their positions to compel anyone to sell his products at a price that he knows to be so low as to be unfair.

CONCLUSION.

To the Filipinos I say, turn your undivided attention to the material development of your country and rest confident in the good faith of the United States. If it were the desire of the United States to prevent the Filipinos from becoming a progressive, happy, and united people, strong in the accumulations of wealth and knowledge and capable of nationality, we should not be devoting our entire energies toward the accomplishment

of those measures which make such a nationality possible; we should not be providing all of the people of the Islands with a common language; we should not be maintaining different organizations of armed Filipinos drilled in the art of war, aggregating 10,000 men, of whom 5,000 are paid from the Treasury of the United States as United States troops; we should not be extending the privileges of occupying the more important posts in the Government service to Filipinos; we should not be devoting our first efforts toward binding the Filipinos together into a closer union by those ties which come from improved means of communication, as post-offices, telegraphs and telephones, railroads, roads, subsidized steamboats, and so forth.

I regret to have to say that in my judgment in some instances the Filipinos themselves have hindered the fruition of these efforts, as for example by discouraging the universal adoption of a common language, by endeavoring to avert the opening of the markets of the United States to Philippine products, and by discouraging the coming of capital, thus impeding and delaying the arrival of that time when a national existence will be possible.

The success of an administration varies directly with the degree of confidence and assistance given by the people themselves. The desire and ability to assist the Government is characteristic of successful democratic forms of government and I invite the Filipino people to bring to me their recommendations and suggestions of measures for the betterment of their condition with the certainty that I shall always be ready to receive them with sympathetic attention.

To the Americans I say, those of you who wish to see the fullest measure of American success in these Islands should deal courteously with the Filipino. Speak him fair; deal with him fairly, and look after his interests as though they were yours, as indeed they are. To those who are engaged in business I add, do not feel it necessary to make a big profit on each transaction. It is not important that each transaction should be profitable to you; it is important that each transaction should be creditable to you. The great axiom of modern business is that a trade to be a good trade must be a good trade for both parties. A man to really succeed in business must have his clients and customers satisfied. Safe profits are made by economies in operation, in transportation, in methods of production and manufacture and not by charging high prices. See that your customer gets his full money's worth and that the goods which he receives of you are as represented. Those who do

otherwise are enemies to the successful administration of the Islands. It is not that I object to large profits—on the contrary, I should like to see all the merchants here accumulating wealth—but that I believe the methods I have suggested will result in a greater volume of business that will in the long run yield larger and safer returns.

To all of you I say: Have confidence, turn your attention to those occupations which are fitting to people in time of profound peace. There is not on the horizon discernible any cloud which indicates the possibility of any kind of disturbance in the present status of these Islands, either from within or from without, by insurrection or war.

The United States is strong, determined, fixed in her policy, and not to be dissuaded or coerced. The development of the Philippine Islands will proceed along the lines originally set forth, strictly adhered to by each successive administration and by gradual processes in line of declared policy, not by spasms or jerks.

There seems to be in some quarters a fear that with the new administration there is an intended change of régime; that somehow or other the people will be made to suffer by the exercise of something which they designate as "the strong hand." I hope that my hand will prove to be strong in justice, in maintaining law and order, in helping the weak and distressed, in combating the forces of evil. No people want a weak or feeble government. The only persons who need fear the exercise of a strong hand are those who fear justice, or those who for reasons of their own may be planning evil. The man who is loyal to himself, loyal to the people, and loyal to his oath of allegiance to the United States, need have no anxiety. I think that the character and history of the present President of the United States is a guaranty that no man will be allowed to remain a Governor of these Islands who uses his power in an unjust cause or to the disadvantage of the rights of the Filipinos as guaranteed them by the liberal provisions of Congress.

In friendliness, in coöperation, there is strength; in recrimination, in hostility, there is weakness. Let us all reach out the hand of friendship to our neighbor and endeavor to promote an era of good feeling, of ample confidence, of mutual respect, and of coöperation that we may all secure the realization of the main object to the attainment of which all the energies of this administration are hereby pledged; namely, the material prosperity of the Philippine Islands.

THE SALE OF THE SAN JOSE FRIAR LAND ESTATE.

Early in December one of the largest sales of public lands which has ever been consummated in the Philippine Islands was made to Mr. E. L. Poole, who was formerly engaged in the sugar business in Cuba and later in the Hawaiian Islands, from which place he comes to the Philippines. This estate, which is situated on the southwest coast toward the southern end of the Island of Mindoro, contains over 22,400 hectares, or about 55,000 acres. It has a sea frontage of about 13 miles, and the harbor, which is on Mangarin Bay, is about 4 miles from the southern boundary of the estate. Beginning at sea level the land rises gently toward the mountains. Two large rivers pass through the estate, but there are a number of smaller streams. The larger part of the land is virgin soil and a considerable portion of it is covered with good timber, including the best molave, ipil, and lower grades. The estate is practically uninhabited save by a few Mangyans who belong to the wild tribes.

Soundings for a wharf at Pandarochan Point near the barrio of Mangarin have been made and the materials for the construction have been ordered. The survey for the railroad—about 20 miles—which will run from this wharf through the estate is in progress. Seed cane has been ordered and buildings for homes of employees, for a hospital, and for other purposes are being erected.

The sale of this land was made under the Friar Lands Act (No. 1120) of the Philippine Commission, and became effective January 4, 1910. Under the terms of the sale Mr. Poole made the first payment to the Philippine Government on that date. The balance of the purchase price is to be paid in equal annual installments until the whole amount, ₱734,000, has been paid. These annual installments will bear interest at the rate of 4 per cent per annum. It is understood that this estate together with some lands adjoining will be converted into an immense sugar plantation under the management of Mr. Poole, the operating firm being The Mindoro Development Company, which has been erroneously mentioned as the Havemeyer Company. The San José estate is 165 miles from Manila, 168 miles from Iloilo, and 265 miles from Cebu.

This step on the part of the Insular Government which follows so closely in line with the policy laid down by the Governor-General in his inaugural address, in regard to securing the investment of capital for the development of Philippine resources, should have a decided significance for every Filipino interested in the agricultural, mining, and other resources of his country. While it is the policy of the Insular Government and the determination of the United States to give the Filipinos the first opportunity to develop the resources of their country, it is very evidently not the intention of the United States Government or the Insular authorities to allow these resources to lie idle and undeveloped. In case the Filipinos themselves fail to improve the opportunities given to them to develop the resources of their country and to reap the large profits to be gained therefrom, the entrance of capital and business men from other countries seems inevitable.

THE BOUNTIES FOR THE TOBACCO GROWERS OF UNION, CAGAYAN, AND ISABELA.

UNION.

For the production of the greatest number of kilos of marketable leaves per hectare:

First district.

Name.	Place.	Prize.	Amount.
Vicente Dumo	Naguilian	First	₱121.87
Adriano Milanes	Tubao	Second	73.12
Teodoro Doctoloero	do	Third	48.75

Second district.

Juan Balagot	Bauang	First	₱121.87
Silverio Dumpit	do	Second	73.12
Agustin Dumo	do	Third	48.75

Third district.

(No data submitted hence no awards made.)

For sorting the tobacco leaves in the most uniform manner as regards size, quality, coloring, etc.:

First district.

Name.	Place.	Prize.	Amount.
Juan Verceles	Tubao	First	₱121.87
Liberato Tejano	Naguilian	Second	73.12
Matias Ventura	Tubao	Third	48.75

Second district.

Estanislao Madrid	Bauang	First	₱121.87
Juan Balagot	do	Second	73.12
Aniceto Barnachea	do	Third	48.75

Third district.

Leocadio Ostrea	Balaoan	First	₱121.87
Cipriano Obra	do	Second	73.12
Elpidio Peralta	do	Third	48.75

CAGAYAN.

For the production of the greatest number of kilos of marketable leaves per hectare:

First district.

Name.	Place.	Prize.	Amount.
Domingo Banatao	Iguig	First	₱162.50
Andres Pamittan	do	Second	97.50
Quirico Reboredo	do	Third	65.00

Second district.

W. M. Hawkins	Piat	First	₱162.50
Jacobo Soriano	Tuao	Second	97.50
Luis Serrano	Piat	Third	65.00

Third district.[1]

Moises Adviento	Alcala	First	₱162.50
Fulgencio Pedralves	Baggao	Second	97.50

[1] Only two competitors in this district.

For sorting the tobacco leaves in the most uniform manner as regards size, quality, coloring, etc.:

First district.

Name.	Place.	Prize.	Amount.
Mariano Mallo	Iguig	First	₱162.50
Miguel Masirag	do	Second	97.50
Quirico Roboredo	do	Third	65.00

Second district.

Gonzalo Malana	Piat	First	₱162.50
Luis Serrano	do	Second	97 50
Eladio Lejos	do	Third	65.00

Third district.[1]

Moises Adviento	Alcala	First	₱162.50
Fulgencio Pedralves	Baggao	Second	97.50

[1] Only two competitors in this district.

ISABELA.[1]

For the production of the greatest number of kilos of marketable leaves per hectare:

First district.

Name.	Place.	Prize.	Amount.
Pedro Gammad	Echague	First	₱216.66
Antonia Baccay	do	Second	130.00

Second district.

Vicenta Monteagudo	Naguilian	First	₱216.66
Norberto Cauilan 2º	Gamu	Second	130.00
Mariano Marques	do	Third	86.66

Third district.

Josefa Battung	Tumauini	First	₱216.66
Antonio Paggao	Ilagan	Second	130.00
Jacinto Maddauin	Tumauini	Third	85.66

For sorting the tobacco leaves in the most uniform manner as regards size, quality, coloring, etc.:

First district.[1]

Name.	Place.	Prize.	Amount.
Pedro Gammad	Echague	First	₱216.66
Antonia Baccay	do	Second	130.00

[1] Only two competitors in this district.

Second district.

Vicenta Monteagudo	Naguilian	First	₱216.66
José Lizardo	Gamu	Second	130.00
Melchor Ramos	do	Third	86.66

Third district.

Antonio Baggao	Ilagan	First	₱216.66
Josefa Battung	Tumauini	Second	130.00
Leon Etchore	do	Third	86.66

[1] Only two competitors in this district.

REGULATIONS GOVERNING THE FREE ADMISSION INTO THE UNITED STATES OF PHILIPPINE SUGAR, TOBACCO, AND CIGARS.

EXECUTIVE ORDER NO. 109, 1909.

Whereas coöperative action on the part of the Philippine Government appears desirable for the proper and practical enforcement of those provisions of section five of the United States tariff act of August fifth, nineteen hundred and nine, relating to the limitations and qualifications placed upon the free admission into the United States of Philippine sugar, tobacco, and cigars, the following regulations are, by arrangement between the honorable the Secretary of the Treasury and the honorable the Secretary of War of the United States, promulgated for the information and guidance of all concerned:

PARAGRAPH 1. *All producers of sugar desiring to avail themselves of the privileges of free entry of sugar into the United States, either directly or indirectly, shall file with the Collector of Internal Revenue, in such form and manner as said Collector shall prescribe, written applications therefor before the opening of the shipping season and not later than the first day of November in each year.* Each such application shall contain a statement under oath of the applicant, setting forth the quantity of sugar produced, or proposed to be produced, by such applicant during the fiscal year in which the application is made, the place and manner of production, the area of land employed, or to be employed, by such applicant, if any, its location, the quantity of sugar for which the applicant desires free entry and will ship, or intends to ship, or sell for shipment to the United States, that said sugar has been or will be actually produced by said applicant and such other data as may, from time to time, be required by the Collector of Internal Revenue.

PAR. 2. The term "producers of sugar" as used in section five of the United States Tariff Act of August fifth, nineteen hundred and nine, and for the purpose of these regulations, shall be taken to mean individuals, firms, or corporations who actually produce, or procure the production, from materials owned

by them, of sugar, in its first marketable form, as such, and are owners thereof when it reaches that stage of advancement.

PAR. 3. *The Collector of Internal Revenue shall establish registers and record therein all applications filed in pursuance of paragraph one hereof,* and all changes of ownership of each lot of sugar covered thereby concerning which satisfactory evidence of such changes of ownership is produced to him. He shall investigate all statements of applicants and others involved in such manner as may be necessary to prevent any infraction of the law or fraudulent practice with reference thereto. *Not later than November twentieth of each year the Collector of Internal Revenue shall transmit to the Insular Collector of Customs complete transcripts of the registers herein prescribed with full information pertaining to each entry therein,* showing the owners of record at the date of transmittal, and so arranged as to show in one group the producers, or intending producers, of less than five hundred tons of sugar, and in another group, in progressive order, by quantities, those who have produced, or intend to produce, five hundred tons or more, within the fiscal year for which their application for free admission into the United States is filed. *Thereafter he shall promptly inform the Insular Collector of Customs of all changes in ownership of which he may be satisfactorily advised.* The Collector of Internal Revenue shall also furnish the Insular Collector of Customs, upon request and as required by the latter, with all information in his possession or that may be acquired by his Bureau, which will enable the latter to determine the correctness or incorrectness of "exporters'" (shippers') statements in connection with the certificates of origin required by United States Treasury Department Circular Numbered Thirty-seven, series of nineteen hundred and nine.

PAR. 4. *The Insular Collector of Customs is hereby charged with the duty of causing to be issued at the various ports of entry in the Philippine Islands, under proper regulations,* in strict accordance with the facts and the terms and spirit of section five of the United States Tariff Act of August fifth, nineteen hundred and nine, and United States Treasury Department Circular Numbered Thirty-seven, series of nineteen hundred and nine, *the certificates of origin prescribed in said circular. He will take the necessary measures to prevent the issuance of such certificates of origin in any fiscal year covering sugar, cigars, or tobacco in excess of the quantities of those commodities entitled to free entry into the United States* in any fiscal year under the provisions of section five of the United

States Tariff Act of August fifth, nineteen hundred and nine. The Insular Collector of Customs shall cause certificates of origin covering sugar shipped to the United States to be issued in such manner as to give full effect to the provisions of section five of the United States Tariff Act of August fifth, nineteen hundred and nine, requiring that *"preference in the right of free entry of sugar to be imported into the United States from the Philippine Islands * * * shall be given, first to prducers of less than five hundred gross tons in any fiscal year, then to producers of the lowest output in excess of five hundred gross tons in any fiscal year,"* using as a basis for the arrangement of the issuance of such certificates the registers furnished him by the Collector of Internal Revenue as required in paragraph three hereof: *Provided, however,* That customs officers issuing such certificates shall themselves individually use every precaution to prevent perversion of the provisions of the law herein quoted. The Insular Collector of Customs shall not issue or permit to be issued any certificate of origin until he or such issuing officer shall be personally satisfied from such investigations as may be necessary (1) that the certificates of origin issued by them do not cover merchandise in excess of the limitations prescribed in section five of the United States Tariff Act of August fifth, nineteen hundred and nine; (2) that the statements of the "exporter" (shipper) are correct and that no part or parcel of the merchandise described therein contains foreign materials to the value of more than twenty per cent of the total value of any completed article described in any such certificates; and (3) with respect to sugar, that the issuance by them of such certificate of origin covering that product will give full effect to the provisions of section five of the United States Tariff Act of August fifth, nineteen hundred and nine, relating to the preference to be given to the smaller producers of sugar in their right to free admission of their product into the United States.

PAR. 5. It is hereby made the duty of all officials of the Philippine Government who are required to perform acts in connection with the carrying into effect of the terms of this order to instruct and advise small producers of sugar of their preferred rights in the premises.

PAR. 6. Copies of this order shall be distributed by the Collector of Internal Revenue to all producers of sugar, and to all cigar and other manufacturers in the Philippine Islands, as well as to all other persons interested or concerned.

LABOR CONTRACTS IN THE PHILIPPINES.

EXECUTIVE ORDER NO. 63, 1909.

All Insular, provincial, and municipal officers are prohibited from employing in any capacity (*a*) any man known to have broken a contract or agreement for labor with an employer of labor within three years and who remains in debt to such employer for money, transportation, supplies, or valuables advanced, exclusive of interest thereon, or (*b*) any employer of labor who has broken his contract or agreement with his employees.

All employers of labor are requested to send to the provincial treasurer of their province the name and cedula number of any person who has broken a contract or agreement as above set forth, together with a statement of the circumstances of such violation. The treasurer, after making an investigation sufficient to satisfy himself as to the facts of the case, shall keep a list of such persons and shall forward to the Director of Labor, in Manila, all communications so received from employers of labor.

It shall be the duty of the Director of Labor to compile all such lists and have them printed in circulars or such other manner as may be approved by the Governor-General. It shall also be the duty of the Director of Labor to check over the official roster and pay rolls of the Insular Government, and the duty of the provincial treasurers to check over lists of officers and the pay rolls of the provinces and municipalities, to see that no infraction of this order has taken place, taking especial care that no man guilty of such violation is employed upon any municipal police force.

If any man so disqualified considers himself aggrieved, or believes that his name should not appear on the list, he may appeal to the provincial governor, who shall forward his recommendation to the Director of Labor, who shall decide, after proper investigation, whether the appellant has been wrongfully

listed, and who, subject to such rules and regulations as may be prescribed by the Secretary of Commerce and Police, may order his name removed from the list.

Disqualification for breaking a contract shall last for three years from the date of the breach.

Nothing contained in this order shall prevent the provincial and municipal officials from allowing men who prefer to work out their cedula tax on the roads, or who can not pay the same, to perform the work in lieu of payment.

AN ACT OF THE PROVINCIAL BOARD OF LEYTE TO PROVIDE FOR FIGHTING THE LOCUST AND GRASSHOPPER PEST.

ARTICLE 1. Any person who may note the presence of locusts or grasshoppers at any place in the Province of Leyte, is required by law to report the same at once to the *teniente de barrio* of the district where the locusts or grasshoppers may be, and the said *teniente de barrio* will without any delay (*a*) order that all the able-bodied inhabitants of his barrio with the coöperation of all the *tenientes* and inhabitants of the adjoining barrios be compelled to work for the suppression of the locusts and grasshoppers; (*b*) report at once to the local authorities of his municipality.

ART. 2. Any local authority knowing of the existence of locusts or grasshoppers within his municipality shall notify the municipal president who (*a*) will direct all the members of the council of the municipality to coöperate with the inhabitants of their respective districts in the compulsory work for the destruction of locusts or grasshoppers; (*b*) will report to the provincial governor the existence of locusts or grasshoppers within his municipality and the work done toward suppressing them; (*c*) to convene the municipal council, when possible, in extraordinary session for the purpose of adopting proper resolutions regarding the suppression of locusts and grasshoppers; and when funds are necessary for the work to vote the amount needed from the municipal funds; provided, that in case the municipality does not have sufficient funds for these expenses, the council must ask help from the province.

ART. 3. The municipal president, and the member of the council for the district where the locusts or grasshoppers have appeared, are bound to go to said place in order to personally direct the work of destruction.

ART. 4. Any person who, by virtue of the preceding articles, shall fail to fulfill his duty, shall be declared guilty of an offense and punished by a fine, not to exceed two hundred pesos Philippine currency, or thirty days imprisonment, at the discretion

of the justice of the peace having jurisdiction to judge the violators of these rules.

ART. 5. The funds accumulating from fines imposed for the violation of these rules shall constitute a special fund which will be deposited in the hands of the municipal council, for the suppression of locusts or grasshoppers.

ART. 6. Six official copies of these regulations will be furnished to each municipal secretary of this province, one for the justice of the peace, the other five to be posted in prominent places in the town. The Director of Agriculture and the judge of the Court of First Instance of the Twelfth Judicial District, Tacloban, Leyte, will also be furnished official copies of this act.

EXTRACTS FROM THE ANNUAL REPORT OF THE TREASURER OF THE MORO PROVINCE.

One of the best signs of steady and healthy progress in the development of the Philippines and the surest guaranty of the energy and effort which is being put forth for the permanent improvement of the country is found in the following extracts from the annual report of the treasurer of the Moro Province for the fiscal year ending June 30, 1909.

Comparative statement of provincial revenues by districts for years 1908 and 1909.

District.	1908	1909	Increase.	Decrease.
Zamboanga	₱76,151.20	₱85,813.40	₱9,662.20	
Sulu	31,009.12	34,140.55	3,131.43	
Cotabato	15,213.32	1 , 114.71	3,901.39	
Davao	36,599.09	32,660.59		₱3,938.50
Lanao	10,440.53	18,903.16	8,462.63	

Receipts from the sales of San Ramon farm products for the month of June, 1909, amounting to ₱2,543.89, were received too late to be included in the above report. The total receipts from this source for the fiscal year were ₱9,567.55.

Statement showing customs receipts for fiscal years, 1904 to 1909, inclusive.

1904	₱222,388.77
1905	263,242.13
1906	318,394.40
1907	370,275.20
1908	362,810.51
1909	363,876.50

The government of the Moro Province is the beneficiary of revenues paid upon all foreign goods entered and cleared at customs ports within the Moro Province. Imports which pay duty at ports of entry within the Moro Province amount to approximately one-third of the total foreign goods consumed therein. The balance, or two-thirds, of all foreign goods so consumed must enter and pay duty at ports outside the Moro Province, but within the Philippine Islands; thus the treasury of the

Moro Province receives but one-third of the customs revenues derived from all foreign goods consumed by its people while the Insular Treasury is the beneficiary of the revenues from the other two-thirds. The revenues thus derived by the Insular Treasury are disbursed for Insular and provincial purposes outside the Moro Province. Taking the past fiscal year as a basis, the result would be as follows:

Customs revenues collected within the Moro Province	₱363,876.50
Customs revenues collected by the Insular Treasury upon foreign goods consumed within the Moro Province	727,753.00
Total	1,091,629.00

The ₱727,753.00 collected by the Insular Treasury is due to the capital and energy expended within the Moro Province, but from which result we only receive ₱363,876.50.

AGRICULTURE.

Development along agricultural lines continued during the fiscal year, and is shown by the increased exports, as follows:

Hemp:	
1908	₱892,667.59
1909	946,631.73
Copra:	
1908	399,260.82
1909	459,051.78

While the above statement of comparisons shows the increased value of hemp exported in 1909 over that of 1908 to be only ₱46,025.86, the actual output in piculs (137.5 pounds) was 43.9 per cent greater in 1909 than in 1908. The number of piculs exported were 73,782.64 in 1909 and 51,267.52 in 1908, so that the increased output for 1909 was 22,515.12 piculs.

The average market price of hemp (Davao and Zamboanga) for the twelve months ending June 30, 1908, was ₱17.41 per picul. The average price for the same product for the twelve months ending June 30, 1909, was ₱12.83 per picul. Had the price per picul during 1908 prevailed during 1909, the money value of the hemp exported from the Moro Province would have been ₱1,284,555.76 instead of ₱946,631.73, a difference of ₱337,924.03.

The highest price paid for first-grade hemp during the twelve months ending June 30, 1908, was ₱23 per picul. The lowest price paid for same grade was ₱17.50. The highest price paid for first grade during same period ending June 30, 1909, was

₱16.50 per picul and the lowest price was ₱12. First-grade Davao hemp brought, during the month of July, 1909, ₱15.75, or an average of ₱13.85 per picul.

Copra exports show an increase during the twelve months ending June 30, 1909, over the corresponding twelve months ending June 30, 1908, amounting to ₱49,790.96. The average price paid for this product during the former period was ₱6.25 per picul, during the latter period ₱6.59. The highest quotation for this product during the past two years was ₱8 per picul in July, 1907. The lowest was ₱4.50 per picul in April and May, 1908. Thereafter it showed a gradually rising market, closing June 30, 1909, at ₱7.50 per picul. In July, 1909, it again reached ₱8 per picul. Thus the market had a downward tendency from July, 1907, until May, 1908, and thereafter a gradually rising market, reaching ₱8 during July, 1909.

The total acreage planted to staple agricultural products during the year exceeded that of the previous year. Of the two principal exports, copra was in the ascendency by a very large percentage. Hemp shows a falling off, as compared with the previous fiscal year, due to low prices. The acreage planted to crops for local consumption, such as rice and corn, was at least 100 per cent greater than during the previous year.

The lumber industry shows the output for the fiscal year 1909 to be ₱457,583.89, against ₱185,827.63 for the previous fiscal year. The market price of lumber was the same during both years.

THE AGRICULTURAL BANK.

Statement of deposits and withdrawals from January 11 to June 30, 1909.

Total deposits	₱253,847.99	
Withdrawalls		₱234,028.73
Balance June 30, 1909		24,819.26
	258,847.99	258,847.99
Amount of drafts and telegraphic transfers sold during the fiscal year, 1909		467,560.89
Amount of drafts and telegraphic transfers paid during the same period		23,125.03

The total amount of deposits made with the bank during the above period was much less than estimated at its opening. This is due to the fact that checks drawn by depositors are negotiable only at this bank.

We understand that the appropriation for the year 1910 provides for the expenditure of ₱54,000 for roads and bridges and ₱64,000 for wharves at Iligan and Zamboanga.

GROWING KAPOK IN JAVA.

[Translated from the Dutch by the Hon. P. K. A. Meerkamp Van Embden, Consul for the Netherlands.]

SOIL AND CLIMATE.

Kapok comes principally from Java, and the Javanese product is generally considered as the standard. In business kapok is understood to be the cotton around the seed of the kapok tree (*Eriodendron anfractuosum* DC.). This tree grows from sea level up to an altitude of 2,000 feet and even more, but principally in low-lying ground, say below 800 feet above sea level, where the best kapok is produced. Although in higher altitudes the tree gives a certain amount of fruit, the quantity is smaller and the fruit comes later in the year. The product is also of inferior quality because the fruit often is unripe when the rains begin so that it either does not ripen altogether or the cotton gets spoiled by the rain water entering the opened pod.

The best land for the cultivation of kapok is porous, sandy-clay soil near the sea level or a little above it, in a climate with a dry east monsoon. On sandy soil like that in Kediri, Java, the trees also grow very well. Wet east monsoons always have a bad influence, both on the setting of the fruit and on the quality of the cotton.

METHODS OF PROPAGATION.

The kapok tree can be grown either from cuttings or from seed. From cuttings it is very easily grown, as nearly every piece of the tree, even of pretty old ones, will grow when put in the ground, but it is better to propagate it from seeds, if only for the reason that no trees need be destroyed for the purpose.

The seed must be planted at the beginning or about the middle of the west monsoon in seed beds which must be only lightly covered. If the soil is poor it is recommended that some old stable manure be put in about ten days before sowing. Care must be taken that the plants in the seed beds do not stand too close together. The best way is to sow in rows at a distance of

from 25 to 30 centimeters. The distances can vary according to the richness of the soil.

As soon as the young plants are about 10 to 15 centimeters high the covering can be taken away gradually so that some twenty days after sprouting they are exposed to the full sun. This is necessary because kapok requires a great deal of sun and when too much shaded it grows thin and lanky. Soon after taking away the covering is the best time for removing the poorest plants as it can then be seen which plants are the hardiest. No work is necessary on the seed beds except weeding, but if there is a long period of dry weather it is necessary to water the plants or better still to irrigate the soil. About the beginning of the following west monsoon the young trees can be planted out.

Transplanting.—Kapok is often planted along the roads on the coffee and cacao plantations. A distance of from 12 to 15 feet between the trees is usually sufficient. It is recommended to plant the kapok when the plantation is newly opened up. If the plantation is older and already gives shade it will happen very often that the kapok grows lanky and forms into thin trees with few branches.

If kapok is to be the chief product and the whole land is planted therewith, it is recommended to plant not more than 250 trees per *bouw*,[1] as when closer together the trees soon interfere with one another. This is the case when the soil is rich and the land low. If the soil is not so good or if situated at a higher altitude, shorter distances between the trees may be allowed.

Before transplanting it is best to strip off all the leaves and to cut the tree itself down to a height of 1½ or 2 feet, also cut the chief roots so as to make stumps of them. Of such stumps a large percentage will grow. After a year it can not be seen where the cutting has been done. If the tree is not cut short the top will usually die right down to the ground, which of course means that the growth of the new top will be retarded even if the whole tree does not die. It is recommended that holes be made in advance in which to plant the trees. It is necessary to keep the soil thoroughly free from weeds, especially from cogon.

INTERTILLED CROPS.

During the first years one can plant other products between the young trees provided care is taken not to plant too near to them and not to touch the roots. It is best to plant between

[1] Bouw=0.71 hectare=1.75 acres.

the trees such products as require much sun. It must be remembered, however, that the kapok tree during a great part of the east monsoon has no leaves, and that all plants feed on the soil, so that manuring may be necessary.

A plant much used between kapok trees is pepper, grown on the trees, but when the pepper grows well, the lowest branches of the kapok, say, up to the height of the pepper, will die off, for which reason it is recommended not to let the pepper grow too high, but to cut it down after the harvest every year to a certain height. Pepper must not be planted with kapok before the trees are three years old. If nothing is planted between the kapok trees it will be very useful to keep the soil covered with some kind of legume.

THE HARVEST.

Under favorable circumstances the kapok tree begins to produce in the third year. As only a very few regular kapok plantations exist at present, it can not be stated how large the production will be. A favorably situated plantation in the center of Java, where extensive and regular cultivation of kapok exists, yields during the fifth year about 5 piculs of pure kapok from 250 trees per bouw. Older plantations give more kapok than younger ones. Sometimes isolated and very strong trees yield much larger quantities, and cases have been known where one tree in one year gave 1 picul of clean kapok, but this is of course exceptional.

The kapok flowers about the end of the west monsoon or the beginning of the east monsoon. The fruit ripens toward the end of the east monsoon. When the fruit is ripe it has a yellow-brownish color. It is necessary then to harvest as soon as possible, as otherwise the fruit, when hanging too long a time bursts at the top end, whereby the rain gets inside and the cotton is blown out by the wind.

It is recommended to open the harvested fruit as soon as possible and to take the cotton out. If this is not done quickly the color and the gloss get spoiled. Also if the fruit has been wet by rain it is better to take out the cotton before drying it.

It is very bad to cut off the fruit before it is ripe and by fermentation try to give the cotton the appearance of being cut ripe, as has been done recently on account of the high price of kapok. Such a product is always inferior and its presence in a few bales can considerably reduce the value of the whole. In case the heavy rains or late harvesting make it necessary to collect the last fruit in an unripe state, such products must be

always kept separate and sold as second quality. It is also very bad to moisten the kapok so as to increase the weight.

METHODS OF GINNING.

The seeds are separated from the cotton by beating with sticks. Small quantities of kapok are usually cleaned by hand. The kapok is usually laid on bamboo tables and beaten with thin bamboo sticks, so that the seeds drop through the bamboo and the kapok remains on the table. When in large quantities, the kapok is cleaned in mills consisting of a horizontal cylinder of wood or iron with rows of pins placed perpendicularly on the inside of the cylinder. Inside the cylinder a shaft turns round on which pins are put in such a way that they almost meet those in the cylinder. At one end of the cylinder the kapok is put while at the other side there is an opening for taking out the cleaned kapok. Over the whole length of the bottom of the cylinder, wire netting is placed, through which the seed can drop. Such a mill can be operated by hand or by machine. Other machinery for cleaning kapok is not used in Java.

It is of great importance that no seed should remain, for if the kapok contains even a few of them it has a bad effect on the market price. Formerly the kapok was beaten till the curly part of the cotton disappeared altogether, but lately this part is preferred so that the kapok must not be beaten more than is necessary to get the seed out. The weight of cleaned cotton in one pod is about one-half the weight of the seed.

BALING AND SHIPPING.

For shipping, the kapok is packed in bales by means of hydraulic or hand presses of more or less the same character as those used for tobacco. The weight of a bale is about 36½ kilos with dimensions of 53 by 75 by 99 centimeters. These are the dimensions immediately after pressing but they vary slightly as the kapok expands considerably after it has been pressed. To prevent this, sometimes two bales are put together in the press with iron hoops. As the freight is calculated by measurements, it is of importance to have as small bales as possible. Still the kapok must not be pressed till it loses its springiness as it thereby loses in value. Sometimes bales weigh about 40 kilos measuring 80 by 63 by 68 centimeters. The bale is usually covered with gunny or matting. In Holland they prefer mats, as the tare is less variable; for Australia gunny is generally used.

THE VALUE OF THE SEED.

From the seed, oil is pressed or extracted which is used as a table oil and for making soap. After taking off the skin, which weighs about 45 per cent of the weight of the seed, the seeds give about 25 per cent of oil. The residue is a very good manure containing about 5 per cent of nitrogen. The greater part of the seed is not made into oil in Java, but is exported, principally to Marseilles. Where it is difficult to press the oil out of the seed or to sell it, it is usually ground into pulp and used for manure. The skin of the seed can be burned or put in heaps exposed to the rain and the wind till all is rotten, and then used as manure. It is always recommended to use such manure on kapok plantations.

ENEMIES OF KAPOK.

As yet kapok suffers little from diseases or attacks by insects. The most troublesome pest is the insect *Batocera hector*, which can kill the trees, but is fortunately rare. The best way to fight this insect is, as soon as one sees the holes in the tree, to try to catch it with a bit of wire, or if this can not be done, to put a small quantity of benzine in the hole and seal it up with clay.

Sometimes the fruit is attacked by another insect, *Earias fabia*, but this is more common in cotton. Also a red and black bug, the *Dysdercus cingulatus*, sometimes attacks the fruit.

Helopeltis sometimes attacks the leaves but it is rare in kapok. In general so far the damage to kapok by insects is very small, whilst other diseases produced by fungi are unknown. Sometimes damage is done by a parasite (*Lorantha-ceeen, Jav. pasilan*) which nestles on the branches and causes them to die. As these parasites multiply very quickly by seed it is recommended to cut them out regularly, also the ends of the branches if they show signs of dying. The best time for doing this is after the west monsoon.

The greatest damage is done by bats which are very fond of the young fruit when it is still fresh.

THE COFFEE PLANTATIONS OF TONKIN.[1]

By Dr. P. J. S. Cramer,

Chief of the Botanical Laboratories of the Department of Agriculture, Dutch East Indies.

In the course of a visit to the coffee plantations of Tonkin, I had opportunity to obtain information at first hand regarding certain questions which have arisen in connection with these agricultural ventures. While the purpose of my visit was primarily to study the deformation of the flowers of *Coffea arabica*, which has caused much well-founded anxiety among the planters, I was not limited to this investigation alone, and the following observations were made upon other matters which arose, as well as the main object of study.

Virescence.—Virescence is a phenomenon often observed in connection with the flowers of *Coffea arabica*. This degeneracy takes various forms. In one case, when it is very marked, the flower is reduced until it is about 3 millimeters in diameter, and resembles a small green star. The petals are transformed into tiny greenish points, triangular in shape, measuring at the base scarcely 1 millimeter. Again the flower is almost white, the undeveloped pistil and anthers and the rolled petals indicating virescence. Between these two extremes all degrees are found. As a rule the ovaries of virescent flowers do not develop. It happens, however, that small fruits are found on the branches of the coffee trees which apparently come from the virescent flowers, according to information given me by Mr. Bernard. It appears that these small fruits remain attached to the branches for almost a year. Upon examination under a microscope it is seen that these berries owe their development to excessive growth of the mesocarp, while the seeds remain undeveloped. An abnormal phenomenon is seen here in the brown color of the tissue about the hilum. The size of the ovule is scarcely increased. Virescent flowers then, never result in fruit, and it

[1] From *Bulletin Economique*, No. 78, Mai–Juin, 1909, a report presented to the governor-general of Indo-China by Doctor Cramer.

is evident that continual recurrence of this irregularity will result in a decided shortage of production.

As for the various causes to which this deformation of the flowers may be attributed, it was thought at first that they were to be found in a parasitic malady, like the virescence of flowers due to *Phytoptes*. The careful studies conducted by Doctors Rurel and Zimmermann, however, led to the conclusion that there is no parasite present. The cause was next sought for in the physiological condition of the tree, and the conclusion reached that any factor interfering with the nutrition of the tree might cause virescence of its flowers. Some examples may serve to indicate this. The first flowers which appear on the tree are rarely affected in this manner. This would demonstrate the strong influence of the physiological condition of the tree. Observation has demonstrated also that generally when there is a heavy crop one year, the next year there will be more virescent flowers. Here too the physiological condition exerts an influence. Usually the trees flower in profusion ten days after the first heavy rains. If during these ten days conditions are not favorable to the development of the flowers—particularly when there are continual rains—a large percentage are virescent. In the very humid region of Banjoewangi, in the eastern part of Java, it often happens that two or three flowerings which give promise of being abundant will fail, all the buds opening as virescent flowers.

Excessive dryness will often produce the same result. When the first rains are not sufficient the majority of the buds open too soon, generally producing stunted or virescent flowers. Sudden exposure to the sun in a plantation that has been well shaded may result in the same way.

Soil as well as climate may have a similar effect upon coffee trees planted upon hillsides, where, due to erosion, the superficial layer of earth has been washed away, leaving the roots bare. In such cases only imperfect flowers are found. In plantations where the soil is very rich in humus the phenomenon is less frequent than in poorer ground, and especially stony ground.

Finally, parasites, which sap the vigor of the branches, often occasion virescence. When the *Pentatroma pleybya*, a hemipter, attacks coffee trees, imperfect flowers are usually found above the puncture. On trees attacked by root parasites or grubs, a large part of the flowers develop as green stars.

It was not possible to determine just how far climatic influences contributed to the virescence of coffee flowers in the

Tonkin plantations. For that a more thorough knowledge of the climate than could be gained in a brief sojourn, and more complete information regarding the distribution of rainfall, would be necessary. I take this occasion to emphasize the necessity for registering the rainfall accurately. A very simple and inexpensive apparatus will suffice for this purpose. A knowledge of the rainfall is of the greatest possible importance to the planter, and will help him to forecast the yield.

As for the soil, I do not venture an opinion, this factor being so different from that of Java. I can only advise that the soil be improved with farm and green manures, as well as by means of chemical fertilizers. The dangers attending erosion are also worthy the attention of the planters. In Java experience has taught the planter that he must first of all do everything possible to protect his land against erosion. I have been struck by the fact that in the majority of the plantations of Tonkin this difficulty has not yet arisen. I have seen plantations installed on the sides of hills, with irrigating ditches running down the slope. In Java, under the same circumstances, a plantation would be terraced, or at least the irrigating ditches would be made perpendicular to the slope, and by running them along the same horizontal plane the top layer of soil is not lost. I can not insist too strongly upon the necessity for such measures. Upon asking a planter why he did not run the ditches in a horizontal direction, I was told that they filled up too quickly. But it is just this result that is to be desired, and when the ditches no longer fill up, it will be evident that all the good earth has washed down into the lowlands.

Finally, as a cause which may have some influence upon the formation of abnormal flowers I may cite the gnarls or excrescences which grow upon the trees. These are without doubt due to a parasite, and are worthy a more detailed treatment.

These excrescences develop upon the branches. The characteristic feature in connection with them is that many of the adventive buds which in the normal state would not develop, give rise to branches. On the primary branches are found more or less thick tufts of little twigs with very small leaves, pale green at the base. Among these twigs are usually found a number of flower buds, and the branches are also covered with them. It is remarkable that nearly all of these buds result in abnormal flowers, though when one of the branches grows out and frees itself, so to speak, from the evil, it produces normal flowers.

Not only do these excrescences produce neither flowers nor fruit, but they draw the sap, becoming like parasites upon the

trees, and depriving the other branches of the nourishment that should go to flowers and fruit. Thus they contribute both directly and indirectly to the formation of a large number of abnormal flowers. I attempted to discover in a rapid examination to what cause these excrescences may be attributed. Time not permitting any profound study on the subject, it is not surprising that it was impossible to establish any conclusion. I can only say that we did not find any traces of a parasite in them that could be taken for an insect's puncture, like the kermes of fir trees.

The trouble, though widespread, is not yet of sufficient importance to cause uneasiness, and probably the plantations which suffer from it could be easily relieved by cutting off the affected parts and burning the débris. Though for a time after such a cutting the plantations might look scanty, the planter should not hesitate, because in a few months the trees will have largely recovered. When trees are suffering very much from gnarls (excrescences), cutting back may be resorted to. The trunk is cut off to about a foot above the ground, and care taken to cut obliquely, so that the rain will run off easily and not start decay. When the new sprouts appear, two or three of the most vigorous are saved. It is well to reduce the number to one, later, unless several main branches are desired.

And now a few words concerning pruning. I have noticed that the Arabian coffee tree in Tonkin is much more bushy than in Java. I believe this may be attributed to the slower growth of the tree in Tonkin. It is clear, this being the case, that the same system of pruning which applies in Java will not serve here, for in Java the aim is to keep the tree well tufted, while in Tonkin the trees are trimmed so as to render them more open and not so bushy. However, the points which follow have general application in coffee pruning.

If one of the young sprouts is allowed to grow on a topped tree, it will behave just like a young plant. This characteristic has often been observed in other plants. It is well known that a young plant rarely produces abnormal flowers. Hence the number of such flowers will be decreased by letting the sprouts develop. The blossoms on these young branches always set fruit, and so one is sure of a yield. But it can not be denied that this new crop is at the expense of the older portion of the tree. Competition between the two parts of the tree may go so far that the older part will gradually drop its leaves, all the sap being drawn up into the younger portion. Evidently some measures must be taken to prevent the old tree's being entirely

denuded. The most simple one is to cut back the young growth. The question arises as to whether it is not better to let the sprouts grow, in order to prevent excessive bushiness in the lower part of the tree, and if it would not be well to apply a system of pruning in use in Java, in very humid localities, where the trees tend too much to develop leaves. This system is as follows: The topped tree is trimmed for some years so as to form a shrub with strong primary branches. Then one or two sprouts are allowed to develop at the top. A year or so later a new sprout is allowed to grow beside the first, and after it begins to make some progress the first may be cut off. By proceeding thus the top of the tree is renewed, so to speak, every two years. This could probably be continued for some time. If the lower part of the tree should show signs of wearing out a year's rest will restore it.

On the Bernard plantation I saw fairly large trees pruned in this way, and the flowers on the tree tops were in very fine condition. I have been told that in many places typhoons interfere with the success of this method, but it seems as if this danger might be averted in plantations well shaded by hardwood trees.

Another system of pruning employed by Mr. Bernard consists in cutting out a number of the lower branches of the tree in order to admit more light and air. This system might be compared to the one formerly in use in Ceylon, where the secondary branches were cut alternately on the left and right sides. It seems to me that by means of this system the young wood of the tree would be kept in better condition than by cutting back all the primary branches and saving but a few at the top. Otherwise there is not enough of the old wood to provide surface for the new growth.

Finally, the soil is to be considered. Often the soil lacks a sufficient amount of humus, and to meet this need fertilizers are applied, farm manure if possible, and if not, chemical preparations. I have been asked if an excess of the latter does not produce virescence in the flowers. From knowledge of conditions in Java, where virescent flowers appear frequently in plantations upon which no chemical fertilizers whatever have been used, I can easily affirm that they have no such effect. But while an excessive amount of chemical fertilizers may not be the specific cause of virescence, it should not be forgotten that even its exclusive use will not add enough humus to the soil. That can only be accomplished by means of shade trees and green manures.

It is most desirable, from every point of view, to plant shade trees among the coffee trees. Erosion is thus diminished, the soil is constantly supplied with humus, and the coffee trees are protected against sudden changes of temperature and strong winds. Thus far the principal trees employed for shade are the following:

Eleurites cordata.
Melia azedarach.
Albizzia lebbek.
Eriodendron anfractuosum.
Grevillea robusta.

Albizzia lebbek is the only one of these belonging to the *Leguminosæ.*

Experiments at the Bangila experiment station in Java, as well as those conducted by men regularly in the business, have demonstrated that it is always desirable to choose shade trees from among the *Leguminosæ,* the leaves and débris of which form very valuable fertilizer. But for Tonkin probably some variety of hardwood would be better. The *Leucoena glauca* and the *Deguelia microphylla* I should recommend highly. Both have given excellent results in Java. It would be well to plant at least two kinds, so that if one variety should not do well the other would still suffice to protect the coffee trees.

Another method of supplying the soil with humus consists in the application of leguminous plants, either by planting between the coffee trees from time to time, or before the plantation proper is set out. In the latter case one is more free in his choice of plants. It is an extremely good plan when the land is cleared to plant legumes upon it for a year before setting out the coffee trees. I should recommend as good plants for this purpose *Phaseolus lunatus,* the *Mucuna,* the *Crotalaria* (*C. striata, C. laburnifolia, C. incana*). These are, of course, turned under the surface of the soil, before the main planting.

For the intercalary culture (the legumes planted between the trees from time to time) the *Crotalaria* may be employed, and *Tephrosia purpurea.* The latter has the advantage in that it may be cut several times. *Leucoena glauca,* when cut now and then to prevent its growing into a tree, makes good fertilizer.

While these plants are primarily for green manure they have the additional advantage of preventing erosion. Upon hillsides it is desirable to terrace the land, and when the slopes are covered with legumes erosion is reduced to a minimum. In turning the legumes under the soil the stems are cut several centimeters above the ground, so that the surface remains

covered. Irrigating ditches should always be perpendicular to the direction of the slope, and a pronounced fall should be avoided.

On the whole, our observations may be summarized as follows:

(1) Virescence of coffee flowers is a physiological phenomenon due to the plant's lack of nourishment, and may be the result of climatic, pathological, or agrological conditions.

(2) The climate is a factor beyond our control, but the others may be dealt with as follows:

(*a*) The excrescences which grow upon the trees should be carefully removed.

(*b*) Because of the climate a method of pruning is necessary which shall develop young wood on the tree, either upon the primary branches or the younger growth at the top of the tree.

(*c*) The conditions of the climate and soil will be improved by planting among the coffee trees shade trees, preferably *Leguminosæ* (*Leucoena glauca* and *Deguelia microphylla* being the most desirable).

(*d*) The soil may be improved, first, by growing legumes (such as *Kratok* or *Mucuna*) on it for a year before planting the coffee, and turning the legumes under the soil after they have attained their rapid growth; and second, by intercalary cultures of *Crotalaria* or *Tephrosia*.

(*e*) Where the land slopes, the soil should be protected from erosion by means of terraces and the application of plants which will serve as green manure.

CURRENT NOTES.

A CHIEF VETERINARIAN FOR THE BUREAU OF AGRICULTURE.

For some time the Bureau of Agriculture has been without a chief veterinarian. The matter of stamping out infectious animal diseases has received much attention from the Secretary of the Interior and the Governor-General as well as from the Director of Agriculture. For some time these officials have been looking for a man of the necessary qualifications and it is now believed that they have secured the right man to take charge of the work in the person of Mr. Archibald E. Ward, who is a professor in the agricultural department of the University of California. Mr. Ward is to receive a salary of ₱6,000 a year with the understanding that this will be increased in case he proves to be the man desired for the place. It is believed that the danger from these diseases should be reduced to a minimum, and that they should be under the control of a competent veterinary force the same as are similar infectious animal diseases in the United States and Europe. Mr. Ward will certainly have the coöperation of the different members of the Bureau of Agriculture in his undertaking as well as the best wishes and support of all intelligent persons interested in the development of agriculture and the general welfare of the country. He will sail from San Francisco early in July and will take immediate charge of the work to which he has been assigned, upon his arrival in the Islands.

JAVA AGRICULTURIST IN THE PHILIPPINES.

Preparatory to the coming fiber congress which is to be held in Sourabaya, Java, Dr. E. de Kruyff, managing director of the division of technology for the department of agriculture in Java, has been visiting the Philippines. Dr. de Kruyff, spent about two months in the hemp fields and fiber districts of the Islands studying Philippine conditions with reference to the growing of fiber plants. He was also interested in the progress made in the manufacture of fiber-stripping machinery in the Philippines. Dr. de Kruyff left for Java the first week of February.

TOBACCO EXPERTS FOR THE CAGAYAN VALLEY.

By arrangement with the Bureau of Education Mr. Charles M. Mahan, a graduate of the agricultural department of Kentucky State University, at Lexington, Kentucky, was transferred from the Bureau of Education to the Bureau of Agriculture in January and left for his station at Ilagan in the Cagayan Valley on January 6. Mr. Mahan is a native of the State of Kentucky and resided in one of the tobacco-growing sections until he entered the university. After graduating from the State University in 1907 Mr. Mahan spent a year and a half at the Kentucky State experiment station, during which time he gave special attention to the growing of tobacco. In 1908 he was granted the degree of M. S. by his *alma mater* for his proficiency in science and agriculture.

It should be stated that Mr. Boltus E. Brewer, of the Bureau of Education, who is also an agricultural graduate and a tobacco expert, has been transferred by his Bureau to the Cagayan Valley. Both Mr. Mahan and Mr. Brewer will, in behalf of their respective Bureaus, do every thing they can to assist the tobacco growers in Cagayan and Isabela Provinces.

HAWAII'S INDUSTRIAL AGENT IN MANILA.

Mr. H. P. Wood, chairman of the Hawaiian promotion committee, recently made a short visit in Manila while on a trip around the world. Mr. Wood has been a good friend of the Philippines and has done much to help the Merchants' Association and others in giving a right idea regarding the commercial and agricultural possibilities of the Islands.

A NEW LINER FOR THE INTERISLAND FLEET.

It has just been learned that the firm of Inchausti & Co. have under construction in England a new steamer which it is expected will be in Manila ready for service about the first of August. The plans for this new steamship were sent to England some months ago. The new steamer will be a 16-knot liner for the Manila-Iloilo run, and will make the trip in twenty-four hours, which is twelve hours shorter than the time taken by the best steamers now on this run. It is understood that the new steamship will have forty first-class cabins and double the cargo capacity of the steamship *Panay* which is now used by Inchausti & Co. The merchants and residents of Iloilo are justly jubilant over this good news and the inauguration of the one day service between Iloilo and the capital of the Islands will be fittingly celebrated on the first arrival of the new steamer in that port.

AN EXPERIMENT WITH THE MULBERRY IN NEGROS.

In compliance with the request of a representative of the Agricultural Association for Panay and Negros which was received last September, this Bureau shipped 20,000 cuttings of mulberry trees for experimental planting in the Province of Occidental Negros. Five thousand of these cuttings were consigned to Mr. Timoteo Unson of Bago and 5,000 to Messrs. Felix Robles, Gregorio Rodriguez, and Victoriano Rodriguez of La Carlota. The 15,000 sent to La Carlota were set out on the 5th day of October and the 5,000 consigned to Bago on the 10th. After the planting of these cuttings requests came in from different farmers of Negros for 30,000 more cuttings which the Bureau was unable to furnish. A report on these plants received on November 6 showed that both the cuttings set out in Bago and La Carlota had had a rapid and healthy growth. Apparently the plants are adapting themselves to the soil in this section; as at least 90 per cent of them have taken root and are growing so fast that it was intended to transplant them in the middle of December. As the land at Bago and La Carlota is 12 to 14 meters above sea level it is believed that this elevation contributes to the healthy development of the plant. Relying upon the mulberry trees at the experiment station for food these farmers were planning to import some Japanese silkworm eggs at the beginning of this year to start their experiment in raising silkworms. It is expected that these cuttings will develop sufficiently within the first three of four years to permit the importation of a considerable number of immunized and properly selected silkworms. This experiment which is being carried on by the farmers of Occidental Negros will be watched by other agriculturists with a great deal of interest.

AUSTRALIAN COMMERCIAL AGENT IN MANILA.

Mr. J. M. Sinclair, commercial agent in the Orient for the government of the State of Victoria, Australia, recently spent some time in Manila where he is looking after the interests of Australian trade or furnishing information for those desiring to travel in Australia. Mr. Sinclair has his headquarters at Singapore, an office in Shanghai, and travels all over the Far East. While his business is to develop trade between Australia and other countries of the Orient he is particularly interested in the growing business between the Philippines and Australia.

PHILIPPINE POTATOES.

Probably one of the most interesting agricultural experiments now being made in the Philippine Islands is that which is being carried on by the subsistence department of the United States Army near Camp Vickars in Mindanao. Just outside of Camp Vickars the military government has reserved several hundred acres of desirable land on which it intends to carry on the experiment of raising potatoes on a large scale. In the early part of December a member of this Bureau visited the potato farm where about 15 or 16 acres have been planted with seed from the United States. To all appearances the plants are doing fully as well as potatoes would in any part of the States. Only Moros are employed as laborers on the farm and it is understood that it is the intention of the subsistence department to train their Moro employees to raise potatoes for the Army instead of importing them from Japan as is being done at present. A crate of potatoes which were grown by Moros outside of the reservation was recently forwarded to Manila from which a liberal supply was furnished this Bureau. So far as determined these potatoes were equal in quality to any grown in the United States. While they were not so large as imported potatoes or as large as some which have been received from Benguet and Cagayan, yet they were of a desirable size and large enough to make it profitable to use them providing the industry can be successfully carried on. There is every reason to believe that the crop which is coming on at the potato farm near Camp Vickars will be far superior both in size and quantity to those raised by the inexperienced Moros. It might be added that potatoes grown from seed and onions grown from sets imported from the United States by Mr. T. L. Lewis, superintendent of the San Lazaro Hospital, Manila, in his garden on Calle Cervantes were fully equal in size and quality to the average potatoes and onions grown in the United States.

UNITED STATES TOBACCO EXPERTS IN MANILA.

Mr. H. H. Esberg, vice-president and general manager of the American tobacco firm of M. A. Gunst & Co., arrived in Manila on the last trip of the steamer *Manchuria* for the purpose of investigating the quality of Philippine cigars and the prospects for the trade. Mr. Esberg states that Gunst & Co. have found Philippine cigars very satisfactory. He also states that it is important that the manufacturers of Philippine cigars send their best product to the United States and that the future of

Philippine cigars in the United States will depend almost entirely upon the character of the exports by the cigar factories of the Islands.

Another tobacco expert who came to Manila on December 18 is Mr. B. B. Rich of the United Cigar Stores Company, the largest retail house in the world. Mr. Rich states that there has been a steady increase in the number of Philippine cigars sent to the United States since the making of their first contract last May by Mr. Edward Wise, vice-president, and Mr. John F. Whelan, treasurer, of the United Cigar Stores Company, at which time both of these gentlemen visited Manila. He believes that within the next year or two the Manila factories will be sending to the United States the full quota of cigars allowed free entrance under the new tariff law. Mr. Rich states that he finds the Philippine factories cleaner than those of the United States, and that the workmanship of Philippine cigars is equal to that of any in the world. The United Cigar Stores Company has 600 stores and is the largest individual buyer of any factory in the United States, Cuba, Porto Rico, or the Philippines.

According to other information the tobacco trust has stirred up the labor unions in the United States against the products of the cheap labor of the Philippines and has endeavored in every way possible to keep Philippine cigars out of the United States market.

A SUBSIDY FOR THE MANILA-INDO-CHINA STEAMSHIP SERVICE.

It has been announced that the government of Indo-China will subsidize the steamship service between Manila and Saigon during the year 1910, also that a quick and direct service will be encouraged by Government subsidy between Haiphong and Hongkong, and the service between Bangkok and Saigon improved. It is stated that the French Government in Indo-China already pays subsidies to its steamship lines exceeding half a million dollars annually. It is believed that the Manila-Saigon line will be a profitable one from the freight standpoint, at least, as over 100,000 sacks of rice were imported monthly from Saigon during the last four months of 1909.

THE ORIENTAL PRODUCTS COMPANY.

One of the most gratifying moves on the part of a government official to all those who are interested in the welfare of the Philippines, and especially to those who are anxious to see the Filipino people obtain the largest results from the provisions of the Payne Tariff Law, is doubtless, that made by

Mr. John. S. Hord, formerly Collector of Internal Revenue, when he handed in his resignation as Director of one of the most important Bureaus in the Philippine Islands and associated himself with the Oriental Products Company, which has been recently organized in the United States. To anyone who studies the situation at the present time it is very clear that Philippine products when entering into competition with the natural products of the United States must meet with the closest competition, and it is clear to everyone that the tobacco growers and manufacturers of the United States will not surrunder any part of their interests or business to the growers and manufacturers of Philippine products without the greatest opposition. It is therefore obvious that in order to successfully compete in the United States with United States products, Philippine growers and manufacturers must have duly authorized representatives or distributing agents in all parts of the country.

It was for this purpose that the Oriental Products Company was organized in New York City with its head offices in the Tontine Building, No. 82, Wall Street. The officers are Mr. Charles Landau, president; Mr. Harry Rothschild, treasurer; Mr George W. Gibbs, secretary; Mr. John S. Hord, managing director in the Philippines, and Mr. Charles B. Cameron, tobacco expert. Mr. Charles Landau, the president of the company, is general manager for Upmann & Co., and Mr. Harry Rothschild of Rothschild Brothers, the treasurer, is also treasurer of the Waldorf-Astoria Cigar Company, which has a string of stores in the largest hotels and clubs in the United States. Mr. George W. Gibbs, the secretary, was formerly in the internal-revenue service in Porto Rico, and for the past two years has been engaged in business in New York City. Messrs. Upmann & Co. and Rothschild Brothers are two of the largest independent cigar manufacturers in the United States. They have for many years successfully opposed the American tobacco trust, and, beside increasing their trade, have maintained the quality of their goods. The New York office is in charge of Mr. Gibbs, the secretary, and Mr. Cameron, the tobacco expert, is now in the Philippines, having come to Manila with Mr. Hord. During the early part of January Mr. Cameron and Mr. Hord left for the tobacco sections in the Cagayan Valley.

At the suggestion of Mr. Hord an association of local manufacturers has been organized, the directors and officers of which will soon be announced. Mr. Hord states that the Oriental Products Company will not go into business in the Philippine

Islands either industrially or agriculturally as their organization is purely for commercial purposes. Later it is the intention of the company to develop other lines of business than the tobacco trade, such as the straw-matting industry, for which article the United States pays $7,000,000 annually to Japan and China.

The company has ample capital and a corps of strong and experienced stockholders, as well as the necessary agencies for distribution. Mr. Hord considers his resignation in the light of a duty to the Filipino people to whom he had promised to do everything in his power that they might receive the full benefits of the free-trade provisions of the new tariff law. Unless their interests are safeguarded by some such an organization or association as the Oriental Products Company, who will carry out the plan above outlined for the distribution of Philippine products in the United States, it is clear that the Filipino people will not enjoy the full benefits of this provision of the tariff law which the President of the United States and the leading advocates of the law desired.

NEW STEAMSHIP LINES BETWEEN THE UNITED STATES AND MANILA.

By the readjustment of the sailing schedule of the Great Northern Steamship Company the steamship *Minnesota* will call at Manila both on its outward bound and homeward bound voyages. By the new schedule the *Minnesota* will sail from Seattle to Yokohama, Kobe, Nagasaki, Manila, and Hongkong, and returning from Hongkong Manila will be the first port of call, from which port the vessel will sail for Seattle via Nagasaki, Kobe, and Yokohama. By this arrangement Shanghai is dropped from the ports of call of the Great Northern Steamship Company.

It is stated that the Osaka Shosen Kaisha have entered into a contract to handle the trans-Pacific cargo of the Chicago, Milwaukee and St. Paul Railroad between Tacoma and points in the Far East. The Chicago, Milwaukee and St. Paul Company have arranged to run their trains over the Chicago, Milwaukee and Puget Sound Railroad Company's lines to Tacoma. This company has given special attention to carrying fast freight from Chicago and way points to the Pacific coast and its intention is to give the quickest possible service between Chicago and points in the Far East. The Osaka Shosen Kaisha will open up this service with two steamers, the *Tacoma Maru* and

the *Seattle Maru*, which will make monthly sailings; however, the company intends to run a fortnightly service and to this end they have under construction four other steamers namely, the *Chicago Maru*, the *Panama Maru*, the *Mexico Maru*, and the *Canada Maru*, all of which will have a minimum speed of 15 knots per hour. It is intended that all of these steamers will make Manila a port of call and the first vessel to make the trip will be the *Tacoma Maru* which will leave Tacoma for Yokohama, Manila, and Hongkong about February 1 reaching Manila about March 1.

It is also stated that the Grand Trunk Pacific Railroad Company will build and run a thoroughly up-to-date fleet of modern steamers across the Pacific in connection with their transcontinental railroad lines. This new fleet of steamers will run from Port Rupert in Canada to the principal ports of call in the Far East. It is understood that Manila will be included with these ports and that an agency will be established in this city. With the completion of the arrangements above mentioned Manila will have direct communication with the United States over not less than three competing commercial steamship lines.

THE INSULAR LUMBER COMPANY.

The work of the Insular Lumber Company records the most remarkable progress that has been accomplished by any single industry in the country. The sales of this company during the month of November amounted to 1,000,000 board feet and the manager, Mr. A. Burlingame Johnson, states that even this amount would have been exceeded but for the inability of the company to fill more orders. The company has been compelled to decline single orders for as high as 100,000 board feet. Of the million board feet sold, 300,000 board feet were shipped to the United States and the remaining 700,000 was for consumption in the Philippines.

This company is installing an electric-light plant which will enable the 800 hands which the company employs on its concession and in its sawmills in Negros to work on night shifts as well as days. The company is also installing a new mill which has a capacity of about one-half of the old mill. It is expected to have the electric-light plant and the new mill in operation by the end of February.

It is understood that another company has been organized in Negros which will install a large mill and supply part of the orders for Philippine lumber which the Insular Lumber Company has had to refuse.

SHIPMENTS OF PHILIPPINE CIGARS.[1]

Shipments of cigars to the United States of America during October, 1909.

Exporters.	Cases.	Kilos.
Messrs. Castle-Bros, Wolf & Sons	457	55,655
Messrs. Meerkamp & Co. (La Maria Cristina)	148	13,684
Compañía General de Tabacos	140	22,967
Messrs. Baer Senior & Co.'s Successors (La Yebana)	90	13,337
Messrs. Walter E. Olsen & Co	73	10,439
Philippine Co. Ltd. (La Comercial)	71	9,465
Messrs. Germann & Co. Ltd. (Helios)	32	3,833
Messrs. J. Santa Marina (La Insular)	18	2,196
La Germinal	15	2,882
Messrs. Chion Yu Nam	13	1,728
Messrs. Haddix & Kings	10	1,657
Messrs. Perez Hermanos	10	1,529
Katubusan	10	1,100
Messrs. W. H. Anderson & Co	8	1,380
Philippine Products Co	5	833
Messrs. Macondray & Co	5	544
Messrs. Connell Bros	1	145
Mr. F. Kuttner	1	88½
Total	1,107	143,462½

In all for the month approximately 10,000,000 cigars making in all to date under free trade about 17,000,000 cigars.

Shipments of cigars to the United States of America during November, 1909.

Exporters.	Cases.	Kilos.
Compañía General de Tabacos	304	36,227
Messrs. Castle Bros.-Wolf & Sons	262	32,069
Messrs Baer, Senior & Co.'s Successors	129	19,853
Messrs. Walter E. Olsen & Co	93	12,509
Messrs Germann & Co. Ltd	16	4,961½
Messrs. Meerkamp & Co	46	3,590
La Insular	34	3,249
Philippine Co., Ltd	33	4,822
La Germinal	22	3,946
Messrs. Kuenzle & Streiff	16	2,397
Messrs. Chiong Yu Nam	14	2,348
Messrs. La Cibeles	6	708
La Alejandria	4	590
Manila Warehouse Co	3	455
Messrs. Connell Bros	1	163
Messrs. Sullivan & Francis	1	157
Total	1,011	128,044½

Approximately 10,000,000 for the month and 27,000,000 to date under provisions of the Payne Bill.

UNITED STATES ESTIMATE OF THE PHILIPPINE TOBACCO INDUSTRY.

It has recently been learned that La Insular Cigar and Cigarette Company were during the past year offered $4,000,000 gold by the Murray Commercial Company of Seattle for the La Insular Cigar and Cigarette Factory and its business. This report has been confirmed by Sr. Antonio Barreto, the general

[1] From The Far Eastern Review, Vol. VI, No. 7, December, 1909.

manager of the company. While Sr. Barreto himself favored the sale to the Seattle company, the majority of the board of directors decided that they did not care to sell. It is also stated that as a result of the increase in the wages paid to the employees of the factory that they work only four days each week when previously they worked five and six days. This is also said to be true in the tobacco fields in Cagayan and Isabela as the laborers in the fields, as well as those in the factory, are so ignorant and lacking in industry and enterprise that they care only to earn a sufficient amount for their actual needs and seem to have no thought of providing themselves with better food, clothing, and home environments or of accumulating money for future needs in case of accidents, sickness, or when they have reached old age. This problem is apparently one that can be solved only by education which will make the laboring man desire better things for himself, as well as for his family.

Such an offer by a large business organization in the United States should arouse everyone interested in the tobacco-growing industry in the Philippine Islands to a realization of the possibilities and the value of this industry to the people of the country. The Filipinos, those interested in the development of the agricultural resources of the Islands, and everyone interested in building up the agricultural, commercial, and industrial wealth and credit of the country should see in this single business proposition a sure index of the large results to be obtained from money and energy invested in the tobacco-growing business of the country.

THE TOBACCO CROP FOR 1910.

A careful investigation made by a representative of one of Manila's leading dailies reveals the fact that while most growers of leaf tobacco have been able to sell their crops for fancy prices, and the demand for Philippine tobacco has been greatly increased on account of the passage of the Payne Bill, it is not expected that there will be a shortage in the crop for the coming season inasmuch as investigation at the leading cigar factories shows that the present demand is more for quality than for quantity. With the Government guaranty as to the quality of cigars exported from the Philippine Islands the question of quality is preëminently the one which concerns Philippine tobacco growers. One of the principal items with the cigar factories of the Philippines is the question of obtaining wrapper tobacco, which at the present time is very dear. Very little if any of the Philippine tobacco is fit for use as

wrappers and as a consequence a large part of the leaf for wrappers of Philippine cigars has to be imported from other countries. Judging from the best information obtainable, the tobacco sections of these Islands have as favorable natural conditions of soil and climate as can be found in any other part of the world for growing superior grades of tobacco. The tobacco planters of these Islands should now be most seriously concerned regarding the kinds of tobacco to be raised and the best methods of cultivation in order that the product of their farms may take its proper place with the tobacco from other countries. It would seem that Philippine tobacco planters at present have everything to encourage them to put forth their best efforts in the way of using the best methods for producing the very best grades of tobacco, and the Government is making every effort to coöperate with them to this end.

PHILIPPINE COAL.

The Manila Electric Railroad and Light Company are using Philippine coal mixed with Australian for their power plant which gives light to the city and power for the electric street car lines. The first shipments from the Batan mines arrived on the steamer *Rigel* on December 3 and consisted of 1,000 tons.

Later a shipment of 2,000 tons was received in Manila which was disposed of in the local markets. It is understood that the Batan mining company expects to make regular shipments and that one or two steamers of about 3,000 tons burden will be purchased to handle the output of the mines. At present this is about 200 tons per day. By the first of March it is expected that the output will be increased to 300 or 400 tons per day, or from 9,000 to 12,000 tons a month. The local demand for this coal is so great that the East Batan Company was unable to fill a recent order for 550 tons from the phosphate company on Ocean Island, and it was taken by the Mitsui Busan Kaisha. We have learned later that an order for 2,500 tons of this coal was received from Hongkong on which shipment was made about February 1.

From Cebu it was learned that the Electric Light Company of that city has contracted for the total output of the Danao mine on the Island of Cebu. The output of this mine was formerly used by the Philippine Railway for its Cebu line.

THE SMALL FARMER AND THE SUGAR INDUSTRY IN PANAY.

According to recent reports from Iloilo there has been a decided increase in the interest manifested in the sugar-growing business on the Island of Panay. For some months there have

been shipments of cattle from the China coast to Iloilo for the use of the sugar planters on Panay, and, according to the Iloilo Enterprise, reports from the country around Passi and Dueñas indicate that there is a greatly increased area devoted to growing sugar cane. According to these reports a great deal of land was already prepared in January for which it was impossible to obtain sufficient seed cane. There are a number of small cattle-power sugar mills in that section and cane seedlings are obtained from these mills as the crushing of the sugar cane progresses. It was believed that it would be some time before sufficient seedlings could be obtained to plant the land already prepared.

On the new hacienda of Evans Brothers, near Dueñas, there were over 30 hectares of land ready for planting, and amongst the small farmers in the vicinity of Passi and Calinog it is estimated that there were over 200 hectares which would be planted so soon as the necessary seedlings could be obtained. This interest on the part of the small farmers near Iloilo is one of the most encouraging signs of the revival of agriculture in the Islands.

BORNEO COAL FOR THE PHILIPPINES.

Owing to frequent famines in the local market Messrs. Behn, Meyer & Co., Ltd., have secured the sole agencies in the Philippines for the following companies: The Labuan Coal Company Ltd., on the Island of Labuan; The Cowie Harbor Coal Company Ltd., Sarawak, British North Borneo; The Brooketon Coal Mine, Brooketon, Sarawak, British North Borneo; and the Pulo Laut Coal Co., Pulo Laut, British North Borneo. A cargo of Labuan coal arrived at Manila December 17 and has been followed by regular shipments from the different companies above mentioned. The Labuan coal fields are located on the Island of Labuan, 5 miles to the northwest of Borneo and about 700 miles from Manila. There is a good harbor at Victoria on the south of Labuan Island, supplied with suitable coaling piers. These are equipped with modern machinery enabling the company to place coal in the bunkers of vessels at the rate of 50 tons per hour. Near the piers are sheds for storing more than 10,000 tons, about the monthly output of the Labuan mines. These mines, which are a short distance from the town and harbor of Victoria, are reached by railroad and the coal is mined in an up-to-date manner. Good steaming coal, which is used by the British navy and North German Lloyd Steamship Company, is obtained at this port. The Cowie Harbor Coal Company have a coaling station on the Island of Sebattik in Sibuko Bay, 360

miles south of Sandakan. The harbor has a depth of 120 feet at low water, and the equipment at this station enables the company to handle from 20 to 25 tons of coal per hour. The Brookton mine, which is on the mainland, maintains a supply for steamers at Labuan as well as at the mines. The Pulo Laut Coal Company is situated on the west coast of the island about 6 miles southwest of Kotta Baroe. It is said that this company can load about 40 tons of coal an hour.

This arrangement on the part of Messrs. Behn, Meyer & Co. will greatly increase the supply of coal in the Manila market and open to the Philippines a source of supply which is much nearer and more easily reached than either Japan or Australia, upon which the consumers of coal have had to depend in time past. One thousand five hundred tons of Borneo coal consigned to Behn, Meyer & Co. arrived in Manila on January 6 and we have since been advised that the Philippine Railway Company has placed an order for 5,000 tons of Labuan coal—2,500 for its line in Iloilo and 2,500 for its line in Cebu.

LABOR FOR THE TOBACCO FIELDS.

The Compañía General de Tabacos de Filipinas has asked the Bureau of Labor to assist in securing 1,500 families, preferably Ilocano, for its three haciendas in the Cagayan Valley. Ever since its establishment in the Philippines this company has been noted for its generosity toward its employees. It offers to pay the traveling expenses of each family from its home to the hacienda. It further offers to pay small outstanding debts and advance money for cloths and living expenses. The money advanced will be repaid in sums and at times convenient for the debtors, without interest. Each family on arrival at the hacienda will be given two parcels of land—one for the cultivation of corn and the other for tobacco. Up to the time that the corn crop is ready to harvest the company offers to supply tenants with corn or rice sufficient for their needs. The corn raised by the tenants will become their property and the seedlings for the tobacco crop will be supplied by the tobacco company on the condition that one-third of the crop will become the property of the company and the other two-thirds will belong to the tenant who will be under obligation to sell it to the company. On each hacienda there will be stationed a doctor to render medical attendance free of charge to all who need his attention. Medicines will also be supplied gratis. The system of giving prizes to the growers of the best and largest crops of tobacco will be continued on the estates of the company. In

addition the company will furnish a carabao for each family that desires one on the same condition as money is advanced for other purposes; that is, without interest and payable in easy installments. Director Tinio, of the Labor Bureau, left for the Cagayan Valley during the first week of January with a view to giving the Tabacalera Company and other planters of the Cagayan Valley the greatest assistance possible.

ARTESIAN WELLS.

During the latter part of November the municipal council of Noveleta, Cavite Province, appropriated ₱3,000 for an artesian well in the barrio of Rosario. The well will be put down under the direction of the Bureau of Public Works, and it is the plan of the district health officer to have one or more of these wells in every municipality.

During the early part of December the men who were working on the artesian well in plaza San Pedro in Cavite struck water at a depth of 125 feet. The water rises to within 3 feet of the surface and it is estimated that the well will furnish a flow of about 100 gallons a minute. As soon as possible a pump will be attached and a tank erected so that a supply of pure water will be available at all times. If this plan works out it is intended to lay pipes to supply the principal houses of the city as well as several hydrants for public use.

In January water was struck at 510 feet in a well which is being put down by the artesian well drillers of the Bureau of Public Works at Santa Barbara in Iloilo Province. A flow of 35 gallons per minute was obtained but the water was condemned by the Bureau of Science as containing too much mineral matter so that the well will be sunk deeper, until good drinking water is obtained.

A MODERN SUGAR MILL FOR ILOILO PROVINCE.

According to the "Iloilo Enterprise," Messrs. Evans and Weinstein, of Passi, Iloilo Province, have ordered from the United States a modern sugar mill which will be operated by a 35-horsepower engine. The new mill will be installed on the Passi estate of Messrs. Evans and Weinstein and will be the only mill of its type in that part of the country. As all of the other mills are old fashioned and none of them have more than three rollers, it is expected that the new mill will grind much of the cane which will be grown on the neighboring sugar estates.

THE PHILIPPINE MATCH FACTORY.

One of the most interesting industries in the Philippines is the Philippine Match Factory established by Mr. Carlos Gsell at Mandaloyan, San Felipe Neri, near Manila. This factory was established in 1902 and now furnishes employment for 550 men and women all of whom, with the exception of the foremen, are Filipinos. The daily output is 504,000 boxes of safety matches or more than four times as many matches a day as there are people in the Islands. The wood used in the manufacture of these matches is cut from lumber taken from Philippine forests so that it will be seen that this industry actually furnishes employment for a large number of people who are engaged in cutting the trees in the forest and in transporting the lumber to the factory, in addition to the 550 men and women who are actually engaged in the manufacture of matches. Such industries should receive the support of everyone who takes pride in the prosperity of the Philippines and quality and quantity being equal consumers should always purchase the product of Philippine factories in preference to buying the product of China or Japan and other foreign countries, bearing in mind that by so doing they are helping to furnish employment for their own countrymen and build up Philippine industries.

FILIPINO LABORERS FOR HAWAII.

On December 23, 150 Filipino laborers who have been engaged by Mr. O. A. Steven in different parts of the Islands sailed on the steamer *Manchuria* to work on the Hawaiian sugar plantations. Mr. Steven states that the Filipinos have been found to be very satisfactory laborers on the Hawaiian sugar plantations; in fact equal if not superior to the Koreans and Japanese who have been largely employed by the Hawaiian sugar planters. This is interesting in view of the frequent complaints from employers of Filipino laborers here in the Philippines. It recalls also the Governor-General's remarks on this subject in his inaugural address, in which he expressed himself as believing that the Filipinos, if well paid and given the proper consideration by employers, bearing in mind their peculiar inclinations, will supply a satisfactory kind and quantity of labor sufficient for the development of the Islands.

PHILIPPINE HAT AND UMBRELLA FACTORY.

In 1900 there was established by Mr. Carlos Gsell in Quiapo, Manila, a factory for the manufacture of felt and straw hats and umbrellas. This factory employs 450 men and women and

has a capacity for turning out 250 dozen hats and 150 umbrellas and parasols daily. It is estimated that there are at least 3,000 people dependent upon the match, hat, and umbrella factories of Mr. Gsell for their support. The building up of such industries in the other towns of the Islands is not only possible but just what is needed to bring prosperity to the people and the country. Men who can organize and successfully carry on such factories and business enterprises are the greatest of benefactors to the country. There is scarcely a large city or provincial capital in these Islands which does not have the natural resources necessary for establishing small factories and business enterprises. Every intelligent citizen should make it his business, and do everything in his power to encourage the establishment of factories and the organization of such business enterprises in his section of the country.

SUGAR CROP FOR 1908-9.

During the sugar season for 1908–9, 808,400 piculs of sugar were shipped from Iloilo to the United States. During the month of October shipments were made in three vessels, two going to the Atlantic seaboard and one to the Pacific. The British steamer *Inveresk* took a cargo of 5,649,207 kilos and the *Kalibia* 5,646,048 kilos; both vessels sailed for the Delaware Breakwater. The Standard Oil steamer *Seminole* took a cargo of 5,645,304 kilos to San Francisco on the Pacific coast. According to the reports of the sugar brokers, the crop for the season of 1908–9 amounted to 1,641,631 piculs, or 251,731 piculs more than the crop for the season of 1907–8. The prospect for the crop of the season of 1909–10 is estimated at 1,549,660 piculs. The falling off of the sugar crop for 1909–10 from that of 1908–9 is attributed to damage done by locusts which invaded the sugar sections of Panay and Negros early in the year. More than this, owing to the cattle diseases, many of the farmers did not have the necessary work animals and a part of the crop was planted too late to mature in season.

FORESTRY WORK OF THE YEAR 1908-9.

From the annual report of the Director of Forestry we note that the net revenue from the forestry work for the past fiscal year was ₱100,000 and that the expenses of the Bureau were ₱110,000. The Bureau employs 4 foresters, and 21 rangers and guards. Computed on the area which is being cared for by the Bureau of Forestry, 6,000,000 hectares, the Philippine forests pay the Government a little more than 1.6 centavos per

hectare while the Government revenue from the forests of Germany amounts to ₱6.30 per hectare. As compared with 6,000,000 hectares which the Bureau of Forestry is looking after, Germany has only 2,463,000 hectares of public forest, a little more than one-third of the forest area which is being cared for by the Bureau of Forestry, yet she employs 806 foresters and 3,729 rangers and guards to take care of her public forests. However, the total area of the commercial forests of the Philippines is 16,000,000 hectares and the Director of Forestry believes that this area if properly cared for would pay the Philippine Government as much if not more per hectare than is now received from the public forests of Germany.

The division of investigation does the work of inventorying forestry resources. This division has made maps showing the classification of the forest lands of northern Luzon, Masbate, Ticao, and parts of Leyte, Negros, and Mindanao. The educational work has been carried on along two lines, instruction and propaganda. A number of young Filipinos were employed as assistant rangers and taken to the forestry tract of the Cadwallader Gibson Company where they made a preliminary map of the company's logging operations. These men ran and plotted 6,015 kilometers of trails, and inspected 184 homesteads and 29 cuttings. Sixty-one lectures were given during the year by a Filipino graduate of the Yale School of Forestry and other foresters of the Bureau. It is estimated that this propaganda work reached 60,000 people. The Bureau of Forestry now has 18,109 specimens in its herbarium, nearly 4,000 more than last year. The Bureau is also doing considerable work in carrying on durability tests of Philippine woods. These tests are most important to builders in all parts of the Islands who wish to know the value of different Philippine woods; 577 tests were made at the testing ground at Lamao, in Bataan Province.

RECOMMENDATIONS OF THE IRRIGATION COMMITTEE.

At its meeting held in December last the members of the Committee on Irrigation recommended the appropriation of more than ₱1,000,000 for irrigation projects in different provinces in the Philippines. The largest sum recommended was ₱800,000 for the Ambalangan-Dalin project in Pangasinan. The next largest was for the Pototan project in Iloilo. The entire list of irrigation projects recommended is as follows:

Ambalangan-Dalin	₱800,000
Orion project in Bataan	37,000
Pototan project in Iloilo	277,000
Barugo-Leyte project	60,000
Pililla project in Rizal	5,000

On these recommendations the Department of Commerce and Police has taken no action as yet.

The Ambalangan-Dalin project will cover an area of about 30,000 hectares which will be irrigated by water from the Agno River. The principal products of this section are rice and mangoes. The first estimate for this project was ₱400,000 to cover an area of 12,000 hectares, but the area to be covered has been greatly increased so that the cost will be double the original estimate.

The Orion project in Bataan will cover an area of approximately 1,000 hectares which is principally friar lands. The leading crops are rice and sugar.

The Pototan project will include an area of about 9,000 hectares of rice land in Iloilo Province. It will be irrigated by the waters of the Suage River.

The Barugo-Leyte project lies in the northern part of Leyte to the east of Carigara.

The Pililla project, which is in Rizal, is the smallest one in the list; the area to be irrigated will not be large.

Reports from the irrigation engineers on projects in Ilocos Norte, Capiz, Iloilo, Pampanga, La Union, Batangas, Tarlac, and Bohol were received by the committee.

The committee instructed Mr. H. B. Kirkpatrik, chief of the irrigation division, to prepare an irrigation exhibit at the Carnival. This exhibit included working models of irrigation systems, photos, maps, and plans which were interesting as well as instructive.

SOME RECOMMENDATIONS OF THE PHILIPPINE COMMISSION TO THE SECRETARY OF WAR.

The annual report by the Philippine Commission for the fiscal year ending June 30, 1909, contains many recommendations to the United States Congress which are of interest to Philippine farmers:

First, that if Congress is willing to assist and to expedite the work of the United States Government in the Philippines, it make an annual appropriation of $1,000,000 to be added to the present Insular appropriation for education.

Second, that the Philippine Government be authorized by Congress to sell $5,000,000 worth of Government bonds and that the money realized therefrom be used for the construction of public works which are greatly needed in different parts of the Islands.

Third, that the amount of land which may be acquired and owned or used for agricultural purposes by individuals or corporations be extended to 6,000 hectares.

Fourth, that the mining laws be so amended as to allow the filing of more than one mining claim upon a single lode by the same individual or corporation, and to facilitate the taking up of claims for placer, or mines under water, and to extend the time for the development of coal mines to three years.

Fifth, that a law be passed authorizing the Treasurer of the Philippine Islands, with the approval of the Governor-General and the Postal Savings Bank Investment Board, to make loans to provinces and municipalities.

Sixth, that the amount of land which can be taken up by any person under the homestead law be increased from 16 to 50 hectares, that the amount that individuals can purchase from the Government be increased to 500 hectares, and that the amount that can be sold to corporations be increased from 1,024 hectares to 6,000 hectares.

Seventh, that the Philippine Government be authorized to give free titles under proper restrictions to people who have been in undisputed occupation of land for five years previous to the year 1912.

NOTES FROM OTHER FIELDS.

SUGAR, HEMP, AND COAL IN FORMOSA.

According to the "Far Eastern Review" for December the Japanese Government is taking a most active part in the development of the Island of Formosa. The "Review" states that the sugar production of Formosa at present is equal to one-fourth of the total consumption of the Japanese Empire and plans have been completed to install 30 more sugar mills which will have a total capacity of 4,450 tons a day. In order to encourage the growing of hemp in the Island, the Japanese Government has decided to offer a subsidy of 10,000 yen annually. Official reports place the area of the Formosan coal fields at about 35,000,000 square meters with an estimated deposit of 30,000,000 tons.

COTTON CULTIVATION IN RUSSIA.

From recent reports the area of land under cotton cultivation during the past year in the Russian provinces amounted to about 500,000 acres, which is an increase of 30,000 acres over the area planted to cotton during the preceding year. From the last reports there was every indication that the cotton crop of Russia would be a good one.

BRUSSELS CONGRESS OF AGRICULTURAL ASSOCIATIONS.

One of the most interesting congresses organized on the occasion of the Universal and International Exhibition of Brussels in 1910, will be the first international congress of agricultural associations and rural demography which will take place at Brussels next September.

Besides the official representation of most of the foreign countries, many applications for membership have already been received, and this congress promises to be in every respect a most important one.

The examination of the results achieved, the endeavor to find ways of making yet further progress through the agricultural associations, and the study of every means of improving the lot of the rural population, will give opportunities for papers and for exchanges of views, which will be of the greatest interest.

The papers and reports will form eleven volumes, which will be supplied free to all members. The membership fee is 15 francs, or $3 United States currency, which should be sent to Mr. Vanderoaeren, 220 Chansée d'Alsemberg, Brussels, Belgium.

In most countries propagandist committees have been formed in connection with the congress for procuring writers of papers and subscribers. There is none as yet in the Philippines and an initiative taken in this way by any official committee, agricultural society, or private individual, would be very greatly appreciated.

Such committees, societies, or individuals should communicate with Mr. Vanderoaeren, general secretary, 220 Chansée d'Alsemberg, Brussels, who should know of their action before March 1, 1910.

THE TUSKEGEE FARM.

"The Rural Californian" for November, states that the colored people on Booker T. Washington's farm at Tuskegee, Alabama, have during the past year produced $5,000 worth of oats, 300 acres of good corn, 150 acres of sweet potatoes, and 5,000 quarts of strawberries. They also milked 144 cows and produced a large amount of butter and cheese.

ONION CROP OF THE UNITED STATES.

According to the Crop Reporter of the United States Department of Agriculture, the onion holds the third place among the truck crops of the United States. The yield last year was over 14,000,000 bushels valued at $10,000,000.

THE VALUE OF UNITED STATES POULTRY PRODUCTS.

"The Rural Californian" quotes the Secretary of Agriculture as stating that the greatest crop in America is grass and after that corn, after corn is probably cotton, then comes wheat, and after wheat poultry. The product of the hencoop is now nearly as valuable as that of the wheat field. Rice is the cereal which takes the place of wheat in the Philippine Islands, and, other things being equal, the statement of the Secretary of Agriculture contains an important suggestion regarding the development of the poultry business in the Philippines. The attention of farmers has been repeatedly called to the large imports into these Islands of poultry and eggs which naturally should be supplied by the poultry growers of the Philippines.

THE BEET SUGAR INDUSTRY IN THE UNITED STATES.

From the last reports received from the United States there were 65 large sugar factories located in sixteen different States which were in actual operation during the sugar-making season. During 1908 there were 365,000 acres given over to growing sugar beets and the farmers delivered to the factories 3,475,000 tons of beets.

GOOD ROADS IN THE UNITED STATES.

From figures recently gathered from fourteen different States, it is shown that there is an unprecedented movement through the Southern and Western States for improved highways. Contracts which are already advertised call for the expenditure of between $25,000,000 and $30,000,000, and but for the intense prejudice against automobiles in these States it is estimated that fully $60,000,000 would be available for good roads. In Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, and Oklahoma, convicts are being used largely in the construction of roads. In Missouri money from licenses is appropriated for building good roads. In Kentucky the county courts set aside certain sums to be used on the roads. In Alabama the new roads are paid for partly by the county and partly by the people of the different communities. In some parts of Louisiana the police jury fees are used for the construction of roads. While engineers and competent road superintendents are lacking in all parts of the South and West, nevertheless a great amount of work has been done. In Kentucky $25,000 a year is being raised in each county, by taxation, for road improvement. Bond issues are being made generally for this purpose. The following figures represent the actual expenditures for good roads during the last year. Alabama, $1,576,000; Arkansas, $1,400,000; Florida, $578,000; Georgia, $2,100,000; Louisiana, $952,000; Missouri, $873,000; Mississippi, $1,615,000; North Carolina, $1,359,000; Oklahoma, $775,000; South Carolina, $746,000; Tennessee, $1,622,000; Texas, $4,138,000; Virginia, $688,000; West Virginia, $893,000.

ILOILO SUGAR SHIPMENTS.

By José T. Figueras, *General Broker, Iloilo.*

NOVEMBER.

[Crop 1909–10.]

Date	Vessel.	Destination.	Superior (piculs).
November 6	Kaifong	Hongkong	5,641
November 26	do	do	487
Total for November			6,128

DECEMBER.

[Crop 1909–10.]

December 19	Dakotah	San Francisco	18,400
December 29	Shingking	Hongkong	8,123
Total for December			26,523

Exports on December 31 for 1908 and 1909.

[In piculs.]

To—	1908–09 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States			18,400	
China	43,791		14,251	
Japan	8,000	5,015		
Total	51,791	5,015	32,651	

HEMP STATISTICS.[1]

EXPORTS, IN BALES, FOR NOVEMBER, 1909.

Date.	Vessel.	London.	Liverpool.	Atlantic, United States.	Pacific East and California.	Continent.	Australia.	Other ports.	Total bales.
1909.	Forward	224,121	111,198	549,027	110,190	50,277	15,181	26,664	1,086,958
Nov. 1	Yawata Maru						1,975		1,975
Nov. 5	Monmoutshire	11,464	305			2,245			14,014
Nov. 5	Loongsang							300	300
Nov. 9	Kumeric				5,020				5,020
Nov. 9	Indrasamha			18,609					18,609
Nov. 9	Coblenz						125		125
Nov. 9	Taming							250	250
Nov. 10	Changsha						250		250
Nov. 11	Empire							400	400
Nov 12	Yuengsang					19		150	169
Nov. 13	Zafiro	2,050	1,000			650			3,700
Nov. 13	Sungkian (Cebu)		1,550					50	1,600
Nov. 17	Tean		1,250			500			1,750
Nov. 18	Cyclops	8,147	400			1,700			10,247
Nov. 19	Loongsang					650			650
Nov. 20	Rubi							600	600
Nov. 20	Kumano Maru							120	120
Nov. 26	Yuengsang	1,203	140			453			1,796
Nov. 27	Zafiro	1,029				856		500	2,385
Nov. 28	Ningchow				1,250				1,250
Nov. 22	Kaifong (Cebu)		750						750
Nov. 29	Nikko Maru						412		412
Nov. 30	Alicante		250			121			371
	Total for November 1909	248,014	116,743	567,636	116,460	57,471	18,243	29,034	1,153,701

[1] From "The Far Eastern Review," Vol. VI, No. 7, December, 1909, and Vol. VI, No. 8, January, 1910.

EXPORT OF HEMP, DECEMBER, 1909.

Date.	Vessel.	London.	Liverpool.	Atlantic, United States.	Pacific East and California.	Continent.	Australia.	Other ports.	Total bales.
1909.	Forward	248,014	116,843	547,636	116,460	57,271	18,243	29,234	1,153,701
Dec. 1	Duffield			22,700					22,700
Dec. 3	Loongsang					100			100
Dec. 4	Rubi					250		800	1,050
Dec. 6	Ceasar			1,600					1,600
Dec. 6	Prinz Waldemar						80		80
Dec. 7	Taming							200	200
Dec. 9	Indravengely (Cebu)			29,675					29,675
Dec. 10	Ocean Monarch	10,400	2,337			850			13,587
Dec. 10	Yuensang					74			74
Dec. 11	Zafiro							450	450
Dec. 11	Eastern							90	90
Dec. 13	Kaifon (Cebu)							50	50
Dec. 12	Kremirin	10,032	3,400			600			14,032
Dec. 14	Tean		200			300			500
Dec. 18	Aymerich				3,361				3,361
Dec. 18	Yawata Maru	87						131	218
Dec. 24	Antilochus				1,500				1,500
Dec. 24	Taming					650		25	675
Dec. 24	Yuengsang					344		25	369
Dec. 24	Ocean Monarch	9,243	3,225			550			13,018
Dec. 24	Zafiro					550		250	800
Dec. 27	Indrani			2,225					2,225
Dec. 27	Kumano Maru						980		980
Dec. 28	I. de Panay	250				200			450
Dec. 28	Tean					100		175	275
Dec. 29	Kaifon	50							50
Dec. 30	Loongsang	3,437	363			200			4,000
	Total	281,513	126,368	623,836	121,321	62,039	19,303	31,430	1,265,810

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS FOR NOVEMBER AND DECEMBER, 1909.

[By the Collector of Customs.]

NOVEMBER, 1909.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Total.
Rice	Quantity	Kilos	9,220,562	220,180	2,047,468	45,385	61,397			11,594,992
	Value	Dollars	280,482	8,182	63,207	1,621	2,034			355,526
Beef cattle	Quantity	Numbers	3,213	50						3,263
	Value	Dollars	56,408	1,239						57,647
Hogs	Quantity	Numbers								
	Value	Dollars								
Sugar	Quantity	Kilos	168,786	16,085	9,686	9,185	3,133			206,875
	Value	Dollars	11,115	1,203	716	645	212			13,891
Coffee	Quantity	Kilos	103,512	2,540	3,421	1,304	787			111,564
	Value	Dollars	21,694	605	692	333	215			23,539
Cacao	Quantity	Kilos	32,902	2,250	22					35,174
	Value	Dollars	7,377	647	23					8,047
Eggs	Quantity	Kilos	167,714	76	343		310			168,443
	Value	Dollars	18,668	5	21		15			18,709
Raw cotton	Quantity	Kilos	70,868							70,868
	Value	Dollars	20,208							20,208

EXPORTS.

Hemp	Quantity	Kilos	8,296,308	2,760,375			734			11,057,417
	Value	Dollars	833,448	283,563			98			1,117,109
Sugar	Quantity	Kilos			403,735	757				403,492
	Value	Dollars			20,766	45				20,811
Copra	Quantity	Kilos	12,479,737	5,245,902		61,158	32,185			17,818,982
	Value	Dollars	910,625	420,204		4,459	2,549			1,337,837
Cigars	Quantity	Thousands	16,808							16,808
	Value	Dollars	273,266							273,266
Cigarettes	Quantity	Thousands	3,375							3,375
	Value	Dollars	3,356							3,356
All other tobacco	Quantity	Kilos	1,047,693							1,047,693
	Value	Dollars	150,866							150,866

DECEMBER, 1909.

IMPORTS.

Rice	Value	Dollars	415,821	190,758	24,563	1,808	6,552		639,502
	Quantity	Kilos	12,917,152	6,357,650	862,337	49,648	182,451		20,369,238
Beef Cattle	Value	Dollars	56,440	1,087	9,420				66,947
	Quantity	Numbers	2,202	46	314				2,562
Hogs	Value	Dollars	2						2
	Quantity	Numbers	1						1
Eggs	Value	Dollars	25,050						25,050
	Quantity	Kilos	241,800						241,800
Sugar	Value	Dollars	21,805	769	48	455	386		23,463
	Quantity	Kilos	321,022	10,590	530	6,253	5,676		344,071
Coffee	Value	Dollars	26,168	971	87	139	419		27,784
	Quantity	Kilos	88,292	4,407	367	555	1,821		95,442
Cacao	Value	Dollars	15,734						15,734
	Quantity	Kilos	69,431						69,431
Raw cotton	Value	Dollars							
	Quantity	Kilos							

EXPORTS.

Hemp	Value	Dollars	884,513	476,941		846	400		1,362,700
	Quantity	Kilos	8,808,243	4,612,569		6,874	676		3,428,562
Sugar	Value	Dollars			97,250	102			97,352
	Quantity	Kilos			1,716,569	1,695			1,718,264
Copra	Value	Dollars	777,100	173,000	8,433	7,804	31,991		998,328
	Quantity	Kilos	9,845,213	2,028,257	103,141	103,722	383,915		2,464,248
Tabacco	Value	Dollars	219,491						219,491
	Quantity	Kilos	1,045,012						1,045,012
Cigars	Value	Dollars	276,662						276,662
	Quantity	Thousands	16,915						16,915
Cigarrettes	Value	Dollars	2,589						2,589
	Quantity	Thousands	2,302						2,302

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

[By the Director of the Weather Bureau.]

NOVEMBER, 1909.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar.		Rice.		Tobacco.			
	Albay.		Tacloban.		Iloílo.		Tárlac.		Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.4	2.3	26.8	5.1	27.0	3.3	27.4	0.0	26.0	1.0	27.0	0.0
2	27.0	0.0	26.0	6.5	26.6	0.0	27.4	0.0	26.3	0.0	26.8	0.0
3	26.7	32.3	26.2	8.9	26.4	0.8	27.6	0.0	26.2	0.0	26.8	0.0
4	26.7	1.5	26.3	3.6	26.6	0.3	27.6	0.0	26.4	0.0	26.8	0.0
5	28.1	51.6	25.5	61.6	25.3	22.1	26.8	0.0	26.0	16.0	27.4	0.0
6	26.0	53.0	(a)	62.2	24.7	130.7	27.6	11.2	25.2	41.7	26.6	0.0
7	27.4	0.0	------	3.3	25.3	43.2	24.9	38.4	25.3	27.0	26.0	15.2
8	27.6	1.5	------	41.4	26.2	4.1	27.8	37.1	25.5	23.4	27.1	0.0
9	26.8	4.5	------	0.5	26.0	6.1	28.0	12.4	25.4	3.3	27.8	10.9
10	27.0	61.5	------	2.8	26.0	19.0	26.8	0.0	26.6	0.0	26.6	8.1
11	26.5	67.6	------	7.9	26.0	0.0	26.4	6.6	26.1	18.5	27.0	3.0
12	27.1	5.7	------	0.0	26.2	4.3	26.8	0.0	25.8	0.0	26.8	0.0
13	25.9	18.3	------	45.0	25.6	9.4	26.7	0.0	------	5.1	25.8	0.0
14	25.0	85.1	------	53.6	24.9	4.7	26.8	2.5	------	6.9	26.0	0.5
15	26.3	11.0	------	0.0	26.4	5.3	25.2	12.2	------	91.1	26.1	0.8
16	26.5	4.6	------	0.0	25.3	30.0	27.8	0.0	25.7	1.8	26.8	21.8
17	26.6	14.8	------	0.0	26.0	6.4	27.4	6.4	26.0	2.0	28.1	0.0
18	26.0	0.0	------	1.3	26.0	26.5	26.4	21.6	26.1	110.6	28.4	0.0
19	26.8	0.0	------	19.1	26.4	6.9	26.0	0.0	24.2	91.2	27.1	0.0
20	26.8	0.0	------	0.0	26.4	0.0	26.4	0.0	24.7	49.5	26.2	0.0
21	26.8	0.0	------	0.0	26.3	9.4	26.7	0.0	25.4	0.0	26.3	0.0
22	27.0	0.5	------	0.0	27.0	16.8	27.2	0.0	26.2	0.0	27.2	22.9
23	27.0	2.8	------	0.0	27.0	0.3	27.4	0.0	26.6	0.0	26.6	0.0
24	27.1	1.6	------	1.3	27.1	0.0	28.4	8.1	------	60.0	26.7	0.0
25	27.5	16.5	------	4.0	26.6	9.9	27.8	0.0	------	1.6	26.0	0.0
26	26.4	26.7	------	17.0	26.4	0.0	25.0	0.0	------	0.0	25.4	0.0
27	24.5	18.1	------	6.8	24.4	19.0	26.4	0.0	24.7	0.0	25.5	0.0
28	24.7	42.5	------	9.4	26.0	0.0	26.3	0.0	25.0	29.3	26.4	0.0
29	26.0	22.8	------	2.5	26.5	0.0	27.5	11.9	23.4	6.8	27.2	0.0
30	25.2	19.3	------	6.1	26.9	1.3	25.8	0.0	23.8	14.6	26.4	0.0

Temperature and rainfall for agricultural districts in the Philippines—Ctd.

DECEMBER, 1909.

Date	Hemp.				Sugar		Rice		Tobacco.			
	Albay.		Tacloban.		Iloílo.		Tárlac.		Apparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	24.6	58.2	(a)	1.3	26.1	------	26.2	------	24.3	2.3	25.6	------
2	26.8	7.1	------	1.0	26.7	------	26.7	------	24.3	------	25.8	------
3	25.4	25.2	------	------	26.3	2.3	27.0	8.1	24.6	0.5	26.0	------
4	26.3	11.0	------	12.2	26.2	0.6	25.7	------	23.7	4.3	25.3	------
5	25.7	------	------	3.8	25.9	------	24.8	------	23.2	2.0	25.3	------
6	25.8	0.3	------	2.3	24.9	------	23.6	------	23.5	0.5	24.2	------
7	26.5	------	------	104.3	25.0	3.8	25.4	------	23.2	3.6	24.2	------
8	25.3	------	------	------	25.3	0.3	25.3	------	23.9	1.5	24.2	------
9	25.0	------	------	------	25.7	5.1	25.0	------	24.6	53.6	24.0	------
10	26.5	------	------	4.8	26.2	18.8	27.3	------	24.2	32.8	26.1	0.5
11	26.0	0.3	------	16.3	25.3	10.7	26.8	------	24.6	------	26.7	3.8
12	25.9	------	------	3.8	25.5	------	------	116.8	25.1	5.6	25.6	2.5
13	26.7	------	------	12.2	24.8	1.6	24.8	------	22.4	33.8	25.6	------
14	26.6	3.9	------	------	26.2	------	25.8	0.5	21.0	7.1	26.2	------
15	26.2	------	------	------	25.4	75.4	27.0	------	22.2	115.5	25.6	------
16	26.5	------	------	12.7	25.8	------	26.2	------	23.0	26.4	25.5	------
17	25.4	69.3	------	30.3	25.9	8.6	26.0	8.6	23.0	10.1	25.8	0.5
18	25.3	4.6	------	34.3	24.3	2.3	25.8	------	22.9	------	25.7	------
19	24.6	42.4	------	47.3	22.6	29.2	24.5	------	22.9	5.6	24.6	------
20	24.2	64.8	------	5.1	22.8	5.9	22.0	------	23.9	1.3	23.4	------
21	25.8	6.6	------	38.6	24.7	4.8	25.7	------	24.5	0.5	24.6	------
22	25.3	81.5	------	12.7	24.3	57.9	25.0	------	23.6	0.3	24.5	------
23	25.4	71.8	------	0.8	25.6	6.9	26.5	------	23.5	0.5	25.6	------
24	24.6	21.4	------	10.2	25.4	------	25.0	------	23.4	3.5	25.5	------
25	26.2	34.8	------	5.6	25.5	1.3	25.2	------	21.5	9.9	25.4	------
26	24.3	6.4	------	4.1	25.3	5.3	25.6	------	21.4	1.5	24.9	------
27	24.6	70.9	------	26.2	24.4	0.9	25.0	------	22.4	------	24.0	------
28	25.2	17.5	------	5.2	26.2	------	24.7	------	22.4	------	------	------
29	26.2	13.5	------	15.5	26.4	2.0	24.4	------	23.3	1.3	25.6	------
30	26.3	20.4	------	------	26.4	------	26.3	------	24.0	------	------	------
31	26.3	17.0	------	11.4	25.8	------	27.0	------	24.8	------	25.7	------

[a] The thermometers of this station were broken during the typhoon of November 6, 1909.

PERIODICALS IN THE LIBRARY OF THE BUREAU OF AGRICULTURE.

Everyone interested in the study of tropical agriculture is invited to visit the library and make use of these periodicals.

ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of Western Australia, Perth.
Journal of the College of Agriculture, Tokyo, Japan.
Hawaiian Forester and Agriculturist, Honolulu, Territory of Hawaii.
Tropical Agriculturist, Colombo, Ceylon.
The Agricultural Journal of India, Calcutta.
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Natal Agricultural Journal, Pietermaritzburg, Natal, South Africa.
Agricultural News, Bridgetown, Barbados.
West Indian Bulletin, Bridgetown, Barbados.
The West Indian Committee Circular, London.
The British Trade Journal, London.
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The Cuba Review, New York.
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Journal of the Jamaica Agricultural Society, Kingston.
Bulletin of Agricultural Information, Trinidad.
Journal of the Board of Agriculture of British Guiana, Georgetown.
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Oklahoma Farm Journal, Oklahoma City.
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Kansas Farmer, Topeka, Kansas.
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The Gardeners' Chronicle, London.
Commercial America, Philadelphia, Pennsylvania.
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Horn and Hoof, Seattle, Washington.

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Boletin Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Cuba.
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OTHER LANGUAGES.

Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
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Bulletin de Départment de l'Agriculture aux Indes Neerlandaises, Java.
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Station Agronomique, Port Louis, Colony of Mauritius.
Journal d'Agriculture Tropicale, Paris.
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O Fazendeiro, Sao Paolo, Brazúl.
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PLATE I.—HON. CHARLES BURKE ELLIOTT, PRESIDENT PHILIPPINE CARNIVAL ASSOCIATION.

CARNIVAL NUMBER

THE PHILIPPINE

Agricultural Review

VOL. III MARCH, 1910 No. 3

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EDITORIAL.

THE PHILIPPINE CARNIVAL.

FOR HARMONY AND COÖPERATION.

The third Philippine Carnival has passed into history and we are glad to record that it was not only a success in carrying out the ideas for which the Carnival was instituted, but that the support given to it by the Filipino people and our neighbors in adjoining countries made it a financial success. The report of the secretary of the Carnival Association on February 25 shows that there is a cash balance on hand of ₱17,010.26; bills receivable to the amount of ₱7,785.23; property on hand conservatively valued at ₱11,889.14, and bills outstanding amounting to ₱749.50, which makes ₱35,935.40 the available capital of the Carnival Association for 1911.

The fundamental purpose of the Carnival is to build up a bond of sympathy and a feeling of good will among the people in the Far East. It is a good thing for us to forget, at least for a time, our personal, race, and national prejudices and devote ourselves to good cheer and the common good of all. This year, more than ever before, the Carnival demonstrated that it is not a Manila show, but that it is truly the Carnival of the whole Filipino people and their friends in neighboring countries. The first Carnival made Manila well known as an entertainer, the second Carnival spread the fame of the Philippines throughout the Orient, Europe, and the United States. Last year a number of foreign visitors were entertained, and this year Shanghai, Hongkong, Java, and Australia were well represented.

We are glad to meet and compete with our friends from Hongkong, Singapore, and other countries in the Far East, who are working to solve the same kind of problems as ourselves. The Carnival as an organization for promoting harmony and coöperation in the Far East deserves the support not only of all of the people in the Philippines but of every country in this part of the world. Netherlands India and Australia had creditable exhibits this year, and we hope that there will be much larger and more representative exhibits not only from these countries but also from China and the Federated Malay States at the Carnival of 1911.

ITS EDUCATIONAL VALUE.

No one who visits a fair or exposition can fail to be impressed with its educational value to the masses of the people. In the exhibit of the Bureau of Printing at the Carnival the linotype machine working side by side with the old method of typeset-

ting, and the machines for folding and binding printed matter into pamphlets and books, were striking examples of the immense advantage and value of modern machinery as compared with the old methods. The exhibit of the Bureau of Navigation was none the less interesting and edifying in that it presented to the people the great work which this Bureau is doing for improving interisland transportation and safeguarding in every way possible the products of the farms, shops, and factories when they have gone into the channels of trade and commerce. This exhibit further showed how this Bureau is endeavoring to encourage trade and commerce in all parts of the Islands, and to establish a complete system of port works at the principal commercial ports. The Bureaus of Internal Revenue and Public Works demonstrated by their exhibits at the Carnival something of the character and importance of the work which they are doing for the country. The exhibits of the Bureaus of Science and Forestry showed some of the many undeveloped and marvelous resources of the Islands. The exhibits of the Bureau of Agriculture and some of the provinces were a revelation to many in that they demonstrated possibilities in the way of growing different agricultural products that were believed to be impossible. The Bureau of Education was eminently successful, not only in showing some useful and handsome articles made in the schools but in its practical demonstrations.

A STIMULUS TO AGRICULTURE, MANUFACTURES, TRADE, AND COMMERCE.

One of the most important benefits of the Carnival is the stimulus which it gives to the industries of the people. The series of agricultural conferences held in connection with the Carnival resulted in bringing together a gathering of earnest and intelligent farmers from different sections of the country. The information and the ideas which these delegates obtained will be widely disseminated. The excellent exhibits of agricultural products, of pure-bred horses, cattle, hogs, and poultry have shown the people something of the possibilities of agriculture in this country. All of these factors will undoubtedly tend to encourage the development of our agricultural and other resources. The demonstrations made by the Bureau of Education, showing improved methods for manufacturing many Philippine products, should have very practical results both in increasing the total output and in improving the quality of our local manufactures. That trade and commerce, both interisland and that between these Islands and other countries, is stimulated by the Carnival can not be questioned. At the last Carnival special

credit is due the different Bureaus which furnished exhibits showing the work which they are doing for the country; still greater credit is due to the ten provinces which sent exhibits of their products.

The able management of the Carnival of 1911 is assured by the personnel of the Board of Directors. It is now time, therefore, to offer such suggestions as may seem desirable to further its success and to give our assistance to these men in every way possible. It is believed that the industrial features, which furnish the strongest argument for making an annual carnival a permanent institution, should be given more attention each year. In this connection it would seem desirable that the agricultural and commercial interests of the country be more largely represented on the board of directors than heretofore. The farmers, the manufacturers, and the merchants should know that their interests in the Carnival are being handled by their own representatives. It has been suggested that the provinces should be represented on the board of directors. One of the most difficult, and at the same time one of the most essential, factors in the ultimate success of our carnivals is a larger participation by the provinces, and any reasonable measures that will tend to encourage such participation should receive consideration.

It has also been suggested that the present plan for provincial exhibits tends to stir up provincial and sectional rivalry instead of rivalry between the individual farmers, growers, or manufacturers. Instead of a dozen or fifteen provincial buildings for the coming Carnival, it has been suggested that we have four or five large buildings for *agricultural, machinery, live stock,* and *commercial exhibits,* that the agricultural building be divided into departments for the exhibit of the leading agricultural products, such as fibers, sugar, coconuts, and tobacco. There should also be departments for general farm products, such as seeds and grains, vegetables, fruits, potted plants, flowers, etc.; a department for household industries, and a miscellaneous division. It is believed that there should be two or three prizes for the best exhibits in each department or division which should be given to the individual exhibitors, inasmuch as the ultimate end of all such exhibitions and prizes should be to develop and improve the work of the individual farmers, craftsmen, and manufacturers.

It would seem that one of the most important features of the Carnival exposition should be a well-filled machinery building for all kinds of machinery and that special demonstrations should be given daily showing the particular use and merits of each machine on exhibition.

THE INFLUENCE OF AGRICULTURE ON THE FUTURE OF THE PHILIPPINE ISLANDS.[1]

By His Excellency, the Governor-General, WILLIAM CAMERON FORBES.

I have chosen as the subject of my address "The influence of agriculture on the future of the Philippines." As you know, agriculture is the basis of all prosperity, the fountain of all wealth; and in order that we may immediately attain the happiness we desire, we should provide that agriculture, through rapid development, may reach a flourishing condition. The word industry is more comprehensive, embracing more than the word agriculture; while it means the cultivation of the soil, it also includes the manufacture of its products, so that agriculture comes first, and manufacture follows it.

THE TENDENCY OF THE FILIPINO PEOPLE.

I notice with sorrow that the Filipinos are more interested in and devote themselves with more earnestness to manufacture. To confirm my assertion, I quote, as an example, the fact that there having been opened two schools, one for agriculture and another for fine arts, the applicants for admission to the former amounted to only the insignificant number of seven, while those to the latter numbered more than seven hundred, thus showing a widespread desire to begin with that which might better be postponed. It is a natural tendency in people to wish to devote themselves to the highest subjects, to the finest arts; and in this respect the Filipinos are no exception to the rule; but owing to the conditions which prevail in the Philippines, men of reputation, those who enjoy the privilege of influencing the country, should direct all their efforts and energies toward urging young men to lift up our prostrate agriculture.

The Filipino people wish to be independent, and to be so, in the true meaning of the word, it is necessary that they should

[1] Address delivered before the delegates to the Agricultural Conferences at the Philippine Carnival, February 7, 1910.

PLATE II.—DELEGATES TO THE AGRICULTURAL CONFERENCES.

devote themselves to the cultivation of the soil in order to obtain from it the products needed for their subsistence. The Philippine soil, fertile by nature, will not be unresponsive to their labor. This is a matter of the greatest importance in all countries that desire to enjoy independence. Observe them and you will see that when, owing to adversity, calamities, or other unforeseen causes, the soil does not produce sufficient food to maintain its inhabitants, commerce becomes paralyzed, and in order that the government may be preserved it tries immediately to remedy the critical situation, thus confirming the conclusion that the most vital factor in the existence of a country is agriculture.

PROGRESS MADE IN THE PHILIPPINES.

In the past few years the Filipino people have made great progress in the administration of justice. Public order is assured everywhere, public instruction is attended, and the Bureau of Health, fighting against diseases and pests which have broken out, has been able to almost entirely eradicate them—at present there is but little cholera.

We have also advanced in regard to public works; we are constructing our buildings and bridges with the best materials; and the administration of the Government—notwithstanding the severe criticisms of the press, which perhaps has not carefully studied the matter, and of the criticisms made by some public speakers who say we waste the money of the people—is very economical. Upon comparing the expenses of other countries and those of the Philippines, the comparison gives us a favorable balance, and I can assure you that, with the exception of education, for which we spend considerable sums of money, in other respects the taxes levied are smaller than those imposed upon the people in other countries, though they are richer and more prosperous than the Philippines. I expect that with your sound judgment, with your unprejudiced and just discernment, you will not give credit to the constant attacks directed against the Government—this being a subject almost necessary for those who, without any ascendency nor authority over the people, want to appear as the most zealous defenders of their rights.

OUR DIFFICULTIES.

In spite of this substantial advancement in administration, in agriculture we have remained stationary. For this paralyzed condition the Government can not be reproached, because the Government does not devote itself to agriculture, but the people. The Government's duty is to see that the interests of the people are rightly administered and to let the people cultivate the soil,

and its only power in the matter is to find out the way of better giving its assistance to the people for the development of agriculture. I have studied the subject and found that *the first difficulty is the lack of draft animals* which have been so generally destroyed by rinderpest. This is the principal factor in the present stagnation of agriculture, and the duty of the Government, therefore, is to help the people in stamping out this disease in the Islands as well as it is the duty of the people to coöperate with the Government in this enterprise. The Government can not do it without the coöperation of the people, nor the people without the assistance of the Government; Government and people are elements which must necessarily work together if success is to crown their efforts. There is necessity of coöperation on the part of both, and when I speak of the Government, I refer not only to the Insular Government, but to the provincial and municipal governments also. I can assure you that I am ready to undertake a campaign against rinderpest. By an Act passed by the Philippine Legislature I am empowered to appropriate the money already appropriated for one object to another, and I have made use of this power to make the fight against rinderpest. Secretary Worcester has this matter under his direction, and I believe that the plan devised will be efficient. If you add your endeavors to those of the Government, I am sure that the black horizon of the past will in due time open and reveal the bright dawn which will light a prosperous and happy future.

If I ought on the one hand to give you the hope of economic welfare, on the other it is my duty to let you have a glimpse of the evils which oppose its speedy and full realization. These are *the lack of titles to lands, and the obstinate and persistent refusal of landlords to construct permanent buildings and introduce any improvements on their estates* if they do not see that these will give great and sure benefits. Regarding the first point, there are many persons who, while in possession of lands, have no title whatever to guarantee their ownership. And what happens then? If they are in need of money to buy work animals or implements with which to cultivate their fields, they can not obtain it from their lands as they have no titles to prove their right of possession. This difficulty is a very great one, which I hope you will try to overcome by every means possible. Concerning the second point, I have nothing to tell you, for you are well aware as to what improvements are being made in your respective provinces.

As I passed through Egypt during my last trip to America, I ascertained the value of lands in that country, which sometimes

reaches $800 an acre. Each small parcel of land is under a legal title. There is an Agricultural Bank which loans money in large and small sums, and all of this has caused agriculture, in a few years, to attain a wonderful development. The landlords have their land surveyed, their boundaries are well defined by landmarks, and everyone knows the part to which he is entitled in each lot of land.

This is what is most needed here, and I do not doubt that you will be able to overcome the difficulties in the way. According to our calculations it seems that more than 70 per cent of the titles in this country are wrong, owing to the mistakes of the surveyors under the former government, which did not care to guarantee the accuracy of the measurements as is now done. I have had the opportunity to examine some of these plans, and found that in many of them the starting point is not well specified; sometimes the differences, on this account, are as great as 15 meters, which is not only troublesome for the owner of the measured lands, but also for the owners of the adjoining lots. I understand very well that this matter is a very delicate and difficult one, and this is the reason why your most serious endeavors must be bent on securing the greatest possible accuracy in the measurements. It is true that we have a court of land registration; but, in spite of it, the issue of titles goes very slowly, owing chiefly to the difficulties which come from settling these matters in the courts.

Everyone is concerned that the plans be correct, and especially the people who pay the taxes, for, if the Government accepts a plan which is not well made and guarantees a title which ought not to exist, the Government has to pay the expenses which may follow, thus damaging the taxpayers who sustain the weight of the taxes. Therefore, it is necessary that all of us should make every effort to see that our plans are correctly made, in order to avoid lawsuits which may present themselves in the future.

STEPS NECESSARY FOR THE DEVELOPMENT OF AGRICULTURE.

In my inaugural address, and in the one recently delivered at the convention of provincial governors, I placed a great deal of emphasis on these four great problems: *rinderpest, locusts, roads,* and *titles.* I do not mean by this that the great problems of the Philippines are reduced to the four subjects spoken of; my only intention is to mark the greatest needs to which the public officials must give their attention. But I was wrong in stating that I insisted only on these four points; *I have also*

called attention to the necessity of giving an impulse to agriculture.

I do not wish to weary you by dwelling upon the necessity of killing the locusts and keeping the roads in good condition. Concerning the first point, I do not doubt that the people, seeing the advantage, will work for their complete suppression; the Government has only to attend to the second point, for, though the people are most concerned, this work is more especially the duty of those who direct and have the reins of government in their hands. I gladly take this opportunity of stating here that the provincial governments respond to this need: I must not insist any more, and I am going to assure you that I am for the conservation and improvement of roads, which constitute one of the most powerful supports of agriculture. I confidently hope that the provincial governments, which have this matter in their hands, will not spare any effort but will earnestly work for these improvements.

If I may try your patience a little further, I wish to say something on *irrigation*. It is not necessary for me to explain to you its importance, which you know very well. The Philippine Legislature has passed a law to facilitate the construction of irrigation systems; and engineers have already been sent to several provinces of the Archipelago to study this matter on the ground. After one year of work they submitted their report, and I have furnished them, in the form prescribed by the Legislature, the necessary money to begin the work. Irrigation systems are being constructed at Iloilo, Pangasinan, Tarlac, Rizal, and Leyte, and I think that we should not stop until irrigation works are established in all the provinces. Those who so far have not received the benefit of irrigation can not complain because we spend in certain provinces the money collected in the others, for the expense of these works will be reimbursed with the money which will be required in payment for the water distributed, giving preference to the regions where irrigation works can be established at the least expense.

I have just submitted for your consideration the more important subjects affecting the economic improvement of the Philippines, but inasmuch as material prosperity does not include everything, I am going, with your permission, to mention something related to the uses and customs of the Filipino people. It is beyond doubt that *the general health* is in proportion to the health of individuals, and, this being so, in order that the Filipino people may support without undue effort the hard labor of tilling the ground, it is necessary for them to attend also

to the natural requirements of the body for its better growth and development. I do not mean that poor people who do not possess any means should aspire to delicacies and a scale of living which they could not sustain, but that, conforming with their means, they should live with all necessary cleanliness and decency. We must, in the first place, adopt measures to induce the people to part with the ugly and pernicious habit of taking the food with the fingers, which is the origin of many diseases that could be avoided by merely guarding in this way against contagion.

Concerning water, one of the most powerful propagators of the epidemic diseases which frequently afflict us, several artesian wells have been dug, and more are being constructed, to obtain a pure supply, and owing to them the mortality in the Islands has greatly decreased. If, having attended to this vital necessity of man, you contribute your efficient help toward lifting up agriculture from the prostrate condition in which it now lies and, as a consequence of it, the better feeding of the people who work, which will bring a rise in salaries, you will have built not only your own welfare, but also, what is more meritorious, the welfare of your countrymen.

THE NETHERLANDS INDIAN EXHIBIT AT THE CARNIVAL.

By Hon. P. K. A. Meerkamp Van Embden,

Consul for the Netherlands.

The Java exhibit at the Carnival which was obtained through the efforts of the Netherlands consulate in this city, was taken up by the Netherlands Indian government, which asked the Society East and West in Batavia to prepare and send to Manila a suitable exhibit of the native industries of Java to represent Netherlands India at the Philippine Carnival.

The Society East and West in Batavia is an association organized for the purpose of promoting native industries. It was noted and commented on by many visitors to the Carnival that the Java exhibit did not represent the larger industries for which the Dutch East Indies are famous the world over. Doubtless many visitors were disappointed that they saw nothing of the products from the great tobacco, coffee, or tea plantations on Java and Sumatra, and none of the spices for which some of these islands have been famous for many years. The exhibit, as stated, consisted solely of products of the smaller industries of the native people of Java and the other islands, such as samples of Javanese cloths, work in metals, wood carving, and articles made from the skins of snakes.

The exhibit of native cloths consisted principally of *batteks,* native cotton cloths made into sarongs in Samarang, Sourabaya, and other towns of Java, Sumatra, and nearly all of the larger islands. The sarong, or skirt, formerly worn by men and women alike, but now only rarely by men, is a strip of cotton about 2 meters long and 1 meter wide, which is drawn tightly around the hips, the fullness gathered in front, and by an adroit twist made so firm that a belt is not necessary to native wearers. The coloring of these cloths is a very interesting and complicated process which it is believed is used solely by the Javanese. Men and women painting these cloths, trace a first outline in a rich brown

waxy dye, which is the foundation and dominant color in all *batteks*. The parts which are to be left white are covered with wax, and the cloth is dipped in or brushed over with the dye. This resist or mordant must be applied for each color and the wax afterwards steamed out in hot water, so that a single sarong goes through many processes and handlings, and is often the work of weeks. The dyes are applied hot through a little tin funnel of an implement tapering down to a thin point, which is used like a painter's brush, but will give the fine line-and-dot work of a pen-and-ink drawing. The value of a sarong depends upon the fineness of the drawing, the elaborateness of the design, and the number of colors employed. Beginning as low as two pesos, brilliant cotton, or hand-painted calico sarongs, increase in price to forty or sixty pesos. In addition to these cloths, there were some cloths and garments made by the Achinese, who live in the northwest extremity of Sumatra. This exhibit included a fancy cushion made in Sumatra and a shawl made in Dutch Borneo.

The exhibit of Javanese metal work was quite complete and contained samples of vases, bowls, and numerous other articles made of copper which came from Sourabaya. Beside the work in copper, there were many excellent specimens of cigar and cigarette holders made of pure tin which came from the Island of Billiton, also samples of brass and other ornamental articles. There were some very interesting specimens of useful and ornamental articles made of silver by the native silversmiths of Buitenzorg. The Javanese are quite adept in these arts, and in many respects it was noted that their work, while it showed the effects of Buddhistic religious influence and some evidences of European environment, was of much the same character and grade of workmanship as that done in many parts of the Philippines. Beside these, there were also some specimens of brass work done by the natives of Borneo which very much resembled the Moro brass which was on exhibit from the Moro Province.

Another feature of this exhibit which closely resembled work done in the Philippines was the samples of paper knives, spoons, penholders, etc., made from the horns of the carabao or water buffalo.

The wood carving exhibit indicated perhaps a greater development of this industry by the Javanese than has been made by the people of the Philippine Islands. The samples of wood carving consisted very largely of images and ornamental pieces which were very interesting to students of anthropology and curio hunters.

There were also a number of samples of what are commonly known as *petacas,* or cigar and cigarette cases, which were made of nito, burí, and various grass fibers. These little cases were cheap and were all sold during the first two or three days of the exhibit. In this part of the exhibit there were a few Javanese hats made of similar materials, which sell in Java for 15 cents Javanese money or about 12 centavos Philippine currency. As to what stage the art of making these hats has been developed in Java we have been unable to learn, but it is very apparent that labor is not so expensive in Java as in the Philippines and that grade for grade the Javanese hats sell for about one-half the price obtained for Philippine hats.

One of the most unique and interesting features of this exhibit, which represented a fairly well-developed industry in Java, was the exhibit of articles made of snake skins, such as ladies' belts, purses, card cases, and a great variety of similar articles which attracted a great deal of attention on the part of visitors to the exhibit. This industry is quite prosperous in Java, and the articles made from the skins of different reptiles are not only very attractive but the art of tanning these skins has been so developed that articles made from them are found to be durable and satisfactory souvenirs of a most interesting industry which is carried on in but few parts of the world.

It is hoped that for the Carnival of 1911 it will be possible to interest the Javanese government in sending an exhibit of the larger and more important industries of the country from the old plantations about Buitenzorg, and from the great tobacco, sugar, and coffee estates. Such an exhibit would not only be of great interest to the large hacenderos of the Philippines but would advertise these plantations and their products throughout the Far East.

We see no reason why such an exhibit as was made at the agricultural exhibition at Medan, Sumatra, in August, 1908, can not be made at the coming Carnival. At that exhibition different kinds of tobacco plants were shown; the director of the agricultural experiment station showed a complete series of plants under glass cases affected by diseases which prey on tobacco, together with an exhibit of the insect enemies of the tobacco plant in their various stages, all neatly set up in glass cases, easy to inspect and study. To supplement these exhibits, there were huge photographs which illustrated different phases of tobacco culture. Not less interesting were samples of tobacco soils from different parts of Sumatra, Deli, Langkat, Serdang, and other places, also a complete equipment of apparatus for the

analysis of soils. Such an exhibit would serve to give many people outside of Java who are consumers of Sumatra tobacco an adequate idea of the tobacco industry in the Dutch East Indies which would naturally add to the interest as well as the sale of the Sumatra product. Such an exhibit would not only be interesting but edifying to everyone in the Far East who is interested in the tobacco-growing business. More than this, Java's large estates or plantations devoted exclusively to the sugar-cane, coffee, and tea industries have reached a high stage of development. Exhibits showing the varieties of plants grown and the methods of cultivation on these plantations would attract visitors not only from the Far East but more or less from all parts of the world.

Beside these industries, Java is noted for its spices, and several of the islands, designated the Spice Islands, furnish a large part of the nutmegs, cinnamon, cloves, and pepper to the markets of the world. An exhibit of such products would attract attention to these industries of the Dutch East Indies of which little is known at the present time. The Botanical Garden at Buitenzorg could furnish an exhibit which, if adequately representing the great scientific work which has been accomplished at that place, would be a lesson to the world. Netherlands India with the Federated Malay States, Ceylon, parts of the China Coast, and the Philippines constitute one great field of tropical agriculture in which the conditions are very much the same; and these countries should coöperate with one another in solving their common problems. It is sincerely to be hoped that at the coming Carnival Netherlands India will be represented by an exhibit which will do credit to her industry, progress, and commercial importance.

THE QUEENSLAND EXHIBIT AT THE CARNIVAL.

By Dr. GERALD MCKAY,
Assistant Director-General.

Until last October very little had been done toward securing an exhibit of Australian products at the Carnival. About the first of October the writer was appointed an assistant director-general of the Philippine Carnival Association and very soon after left for Australia, where he interviewed the different heads of the governments of Queensland, New South Wales, and Victoria with reference to sending an exhibit to the Carnival. Owing to the coal strike, which was at its height at this time, it was impossible for the Australian officials to get together a satisfactory exhibit, especially at such a late date. It is well known to those familiar with exposition work that it takes months to get together a representative exhibit for such purposes in a home country, but when it takes three weeks to transport these goods to the exposition, which is the time required from Australia to Manila, much more time is necessary. The collection of Queensland products exhibited were gathered in Brisbane under the direct supervision of Mr. J. Scriviner, Under Secretary of Agriculture for Queensland.

The exhibit consisted of specimens of cereals, tobacco, sugar cane, flax, fibers, coffee, and pictures of farm life in Queensland. In addition to the Queensland exhibit, ten horses, a number of fine dogs, and a good collection of poultry were brought from Sydney. There were about ten Australian visitors to the Carnival, one of whom, Mr. Carl Zoeller, was placed in charge of the Queensland exhibit.

Six of the ten horses were prize winners at the horse show. During the show one pair of the grays was sold at ₱2,000, and the buyer has since sold them at a good profit. Another of these horses was a fine jumper, for which ₱600 was refused at the horse show, and a pacing pony from Melbourne, for which ₱500 was offered.

At the dog show the Australian exhibits figured prominently. Amongst these was the first-prize bull dog Arguide of Mr. Charles A. McDonough, the first-prize bull pup of Mr. B. F. Rahmeyer, Mr. John Kennedy's three prize Airdale dogs, Mr. J. M. Marker's cocker spaniels, and two bull bitch pups which took first prize were later sold for ₱305.

At the poultry show there were several Australian exhibits, consisting of Silver-laced Wyandots, Buff Orpingtons, Indian game chickens, and Bantams. This poultry came from the prize poultry farm of New South Wales known as "Martin's Paramatta Poultry Farm."

It is believed that it will be a very easy matter to secure a representative exhibit from Queensland, New South Wales, and Victoria for the 1911 Carnival providing the matter is taken up in time to allow the officials or committees in these States to get satisfactory exhibits together and ship them to Manila. There is every reason to believe that the Australian officials, who have manifested a great deal of interest in Philippine affairs, would make strong exhibits of horses, dairy cattle, and dogs; also a good exhibit of canned goods, such as meats, butter, and vegetables, in which products Australia already enjoys a large share of our trade. In addition to these there could doubtless be obtained an exhibit of grains and different kinds of feed for horses and cattle, also an exhibit of Australian coal. There would be no question about getting quite a number of Australians to visit the next Carnival if a trip were arranged.

It is suggested that steps be taken through the English consul or Australian representative in Manila to have a committee appointed in each State, composed of exporters of Australian products to the Philippines and the officials of the department of agriculture, for the purpose of preparing a representative exhibit of Australian products for the next Carnival.

THE INSULAR AGRICULTURAL ASSOCIATION.

By E. A. CODDINGTON,
Secretary of the Association.

The first Agricultural Conferences at the Philippine Carnival, which were held under the auspices of the Bureau of Agriculture, February 7 to 12, inclusive, were one of the most marked successes of any department of this year's Carnival. These conferences were attended by seventy-three delegates from twenty-two provinces, the College of Agriculture, and the Philippine Normal School. The number of delegates from the different provinces were as follows:

Rizal	9	Sorsogon	6
Laguna	7	Leyte	4
Cavite	1	Cebu	2
Bataan	2	Oriental Negros	2
Bulacan	5	Occidental Negros	2
Pampanga	6	Iloilo	1
Nueva Ecija	2	Misamis	2
Tarlac	2	Bohol	1
Pangasinan	3	College of Agriculture	5
Union	1	Normal School	1
Ilocos Norte	2	At large	3
Batangas	3		
Tayabas	1	Total number of delegates	73
Albay	1		

During these conferences the following programme was carried out in full:

MONDAY, FEBRUARY 7.

8 a. m.—Music by the Cornell Sextet.

8.10 a. m.—Roll call by provinces.

8.20 a. m.—Recitation, "Regulus to the Carthagenians," by Mr. Manuel Roxas.

8.30 a. m.—Address by His Excellency, the Governor-General.

9 a. m.—Music by the Philippine Glee Club.

9.10 a. m.—Address by the honorable, the Secretary of the Interior, "What We Should Do for the Development of Agriculture in the Philippines."

PLATE III.—RICE EXHIBIT OF THE BUREAU OF AGRICULTURE.

9.50 a. m.—Music by Normal School Chorus.

10 a. m.—Address by the honorable, the Secretary of Public Instruction, "Industrial Education."

Intermission.

10.50 a. m.—Music by Normal School Chorus.

11 a. m.—Address by the Hon. Rafael Palma, "The Need of Farmers' Associations and What They Should Do for the Development of Agriculture."

11.30 a. m.—Music by Normal School Octette.

11.40 a. m.—Address by the Director of Agriculture.

Announcements.

2.30 p. m.—Music by the Cornell Sextet.

2.45 p. m.—"The Problems of the General Farmer in the Philippines," by Dr. G. E. Nesom.

General discussion.

"Animal Industry in the Philippines," by Dr. F. C. Gearhart.

General discussion.

Question box.

TUESDAY, FEBRUARY 8.

8.30 a. m.—"The Fiber Industry," by Mr. M. M. Saleeby.

General discussion.

"Rice Growing in the Philippines," by Mr. Silverio Apostol.

General discussion.

Question box.

2.30 p. m.—"Sugar Production in the Philippines," by Dr. Paul C. Freer, and Mr. P. A. Prentiss.

General discussion.

"Tobacco Growing in the Philippines," by Mr. John S. Hord.

General discussion.

Question box.

WEDNESDAY, FEBRUARY 9.

8.30 a. m.—"Coconut Growing in the Philippines," by Mr. Manuel Roxas.

General discussion.

"Varieties of Rice Grown in the Philippines," by Mr. Victorino Borja.

General discussion.

Question box.

2.30 p. m.—"Sugar-cane Growing in Hawaii and the United States," by Dr. G. E. Nesom.

General discussion.

"Maguey Growing in the Philippines," by Mr. M. M. Saleeby.

General discussion.

"Corn Growing in the Philippines," by Mr. Harold Cuzner.

General discussion.

Question box.

THURSDAY, FEBRUARY 10.

8.30 a. m.—"The College of Agriculture," by Mr. Toribio N. Vibar.

General discussion.

"School Gardening in the Philippines," by Mr. S. C. Kelleher and Mr. North H. Foreman.

General discussion.

10 a. m.—The organization of an Insular Agricultural Association.

The object of these conferences as set forth in the above programme was to discuss with the farmers their principal problems, but more especially those with reference to the best varieties of seeds and plants to be used in this country, methods of cultivation, and the manner of harvesting and preparing crops for market.

In addition to this, the purpose of the conferences was to get the representative farmers from different parts of the country together, to get them acquainted with one another and to stimulate personal discussion of their own interests—to build up a bond of sympathy between the different farmers of the Islands for the purpose of protecting their interests; to show them the most modern machinery for use on Philippine farms; to demonstrate to them modern methods of farming and stock raising by visiting the stations and farms of the Bureau of Agriculture adjacent to Manila; in general to bring about the greatest coöperation possible between the farmers and the Bureau of Agriculture, and on the part of the Bureau of Agriculture and the Government to give the greatest possible encouragement and assistance to all farmers who show a desire to improve the present methods of agriculture in the country and to secure the best results from their farms.

At the conclusion of the conferences the delegates present proceeded to the organization of an Insular Agricultural Association for the Philippine Islands, at which time the following officers were elected:

President.—Dr. G. E. Nesom, Director of Agriculture.

First vice-president.—Prof. C. M. Conner, Assistant Director of Agriculture.

Secretary.—Mr. E. A. Coddington, Superintendent of Publications, Bureau of Agriculture.

Vice-presidents.—Mr. Ismael Amado, Rizal; Mr. Manuel de Leon, Tarlac; Dr. Francisco Liongson, Pampanga; Mr. Ramon Reynado, Pangasinan; Mr. Florentino Rallos, Cebu; Mr. Esteban de la Rama, Iloilo; Mr. Vicente Díaz, Leyte; Mr. Cipriano Lopez, Batangas; Mr. José Figueroa, Sorsogon; Mr. Julio Agcaoili, Ilocos Norte; Mr. Felino Cajucom, Nueva Ecija; Mr. Mariano Crisostomo, Bulacan; Mr. Antonio Yazon, Bataan; Mr. Pedro Perlas, Laguna; Mr. Salvador Rodriguez, Bohol; Mr. Engracio Orense, Albay.

It was voted that provinces not already represented and having provincial agricultural associations be requested to elect a vice-president for the Insular Agricultural Association to represent them in the association. The president and secretary elect were instructed to prepare a constitution and by-laws for the association and submit the same to the vice-presidents for their recommendations.

The work of the association will, in a general way, follow the work already outlined by the first conferences and continue, as above stated, not only to carry out the work of the Insular Agricultural Association but will have as its final purpose the carrying on of the same work on a smaller scale through the organization of provincial and municipal agricultural and industrial associations of a similar nature in the towns and provinces.

On Wednesday afternoon a large number of delegates accompanied by the Assistant Director of Agriculture visited the forage factory and quarantine station located at Pandacan, in Manila, which is one of the largest and best equipped stations of its kind in the Far East. The site of the Manila Quarantine Station includes the forage factory, the twelve buildings of the quarantine station—sheds for the quarantine of live stock and hospitals for sick animals—also the three buildings of the College of Veterinary Science, which is one of the colleges of the University of the Philippines. At the quarantine station the delegates examined the machinery of the forage factory, which was in operation, and inspected the quarantine and hospital buildings, also the newly constructed buildings of the veterinary college.

On Thursday afternoon, a large number of delegates, accompanied by the Director of Agriculture, were conducted by Mr. William Smith, of the Luzon Sugar Refining Company, Limited, on the street cars to Malabon, where they were met by a large *banca* decorated with carnival colors and rowed across the river to the sugar refinery of the company, which is located in the town of Navotas. At the refinery the delegates were met by Mr. John Galbreath, manager of the refinery, who showed the visitors every possible courtesy in explaining the work of the refinery. Many of the delegates expressed themselves as greatly pleased with the high grade of sugar which is turned out by the Luzon Sugar Refinery, which, it might be noted, supplies the larger part of the local demand for consumption in the Philippines.

On Friday morning, undismayed by the rain, a number of delegates, including Sr. Miguel Malvar, of Batangas, accompanied by the Director of Agriculture, left the Paco Station at 7 a. m. for the serum laboratory and Alabang stock farm at Alabang, Rizal, about 15 kilometers from Manila. At the laboratory, the delegates witnessed a demonstration of the manner of producing serum, also inspected the serum herd and other animals at the stock farm. After a luncheon with the superintendent of the farm they returned to Manila at 2 p. m. and

visited some of the leading cigar and cigarette factories of the city.

There is every reason to believe that the next meeting of the Insular Agricultural Association, which will probably be held during the next Carnival, will be the largest assembly of the kind ever held in the Philippine Islands.

INSULAR EXHIBITS AT THE CARNIVAL.[1]

BUREAU OF AGRICULTURE.

The exhibit made by the Bureau of Agriculture at the 1910 Philippine Carnival included agricultural products, tools, and implements, photographs, maps, charts, and publications.

An exceptionally fine showing was made of Philippine fibers, Manila hemp (abacá), the first export product of the Philippine Islands, occupying the most prominent place in this section. A collection of ninety samples of abacá from the district of Davao, Mindanao, was so arranged as to show the quality of the leading varieties of fiber produced in this district, and the commercial grades obtained from each variety. Commercial samples of abacá from Negros, Antique, Capiz, and other provinces, miniature bales of fiber showing different commercial grades, fiber prepared for making textile fabrics, different grades of cloth, cordage, hemp harness, and other materials made from abacá were included in this collection. In connection with the fiber exhibit two different abacá-cleaning machines were in operation on the Carnival grounds, both of which attracted a great deal of attention.

Maguey was represented by a handsome exhibit of machine-cleaned fiber from Cebu, hand-cleaned from Ilocos Norte, and maguey cloth from the Island of Panay. Kapok (tree cotton), which is widely distributed throughout the Islands and is a very valuable material for stuffing and filling, was shown both in the raw state and in the form of pillows and mattresses. Pineapple fiber (piña), used for making the celebrated piña cloth, was represented by excellent samples of fiber and various grades of cloth. White and brown cotton from Cebu and Ilocos Norte, cabo negro, buri, anabo, banana, sansaveria, and other fibers of minor importance were in this exhibit, which also included an excellent collection of hats, mats, baskets, and various other articles made from Philippine fibers.

The major part of the rice exhibit was made up of about 150

[1] Compiled from data furnished by the various exhibiting Bureaus.

varieties of rice grown at the Alabang stock farm of the Bureau of Agriculture during the past year. These varieties were shown both in the ear and in the grain, each species being accompanied by a card giving exhaustive data regarding the variety. This collection furnished an excellent opportunity for rice growers to study the qualities and relative value of the different varieties of rice.

Corn, the importance and extensive cultivation of which in the Philippine Islands are not generally understood, was shown in the white, yellow, and red varieties, both in the ear and grain. An attractive and instructive part of this exhibit was a sample of corn on the stalk, ear and grain, and also corn meal and corn bread, all of which were produced on a farm in the Province of La Laguna.

Of special interest to sugar growers were the models of sugar-making machinery sent to Manila by the China Sugar Refinery, of Hongkong, and through the courtesy of their agents in Manila, Messrs. Smith, Bell & Co., included in the Bureau of Agriculture sugar exhibit. Together with these models were shown samples of different grades of sugar and other sugar products. The collection of canes included a number of varieties from Occidental Negros and an exceptionally large and handsome variety from the Province of Pampanga.

The exhibit of coconuts and coconut products was limited only by the space available. Many varieties of nuts from the leading coconut-producing provinces, commercial samples of copra, oil, numerous articles made from coconut shells, and implements used in harvesting the nuts were included.

Tobacco from both the Cagayan Valley and from the Island of Panay was displayed. The excellence of the tobacco from Panay was particularly noticeable. A number of pots containing growing tobacco plants formed an interesting part of this exhibit.

Coffee showing the berries on the branch, also the product in sacks ready for the roaster, was displayed in considerable variety. Cacao was shown both in the pods and the commercial form.

The exhibit of forage plants and forage products included growing plants of guinea grass, para grass and teosinte, sheaves of sorghum, and millet, and sacks of dried forage from the forage factory of the Bureau of Agriculture at Pandacan.

Vegetables and fruits, both fresh and preserved, were shown in considerable variety, although conditions were not favorable for a large display. A shipment of fresh vegetables and fruits from the experiment station at Trinidad, Benguet, was received daily during the Carnival.

Among the miscellaneous products included in the agricultural exhibit were a large assortment of seeds, both local and imported, a collection loaned by the Philippine School of Commerce, and plows, cultivators, corn planters, and other agricultural implements furnished by Messrs. Castle Brothers-Wolf & Sons.

An instructive part of the exhibit was a series of 250 photographs showing various lines of agricultural work, and the more important agricultural products of the Islands. These photographs were supplemented by a series of outline maps, charts, and statistical tables, showing the relative production of staple crops throughout the Philippine Islands. Complete sets of THE PHILIPPINE AGRICULTURAL REVIEW, bulletins of the Bureau, and considerable printed matter from the United States Department of Agriculture were shown and a large number of copies distributed.

BUREAU OF FORESTRY.

The object of installing a forestry exhibit at the Carnival was to give visitors, foreigners as well as residents of the Islands, some idea both of the vast variety and of the great bulk of Philippine forest products. The first object was attained by showing, as far as space permitted, a large variety of Philippine woods, of manufactured articles and of minor products. An attempt was made to convey some notion of the quantity of timber in the Islands by means of forest maps and of special exhibits, both inside and outside of the building, of woods of the Lauan family, or Dipterocarps, accompanied by statistical placards.

The entire base of the interior walls of the exhibit was lined with a series of more than a hundred log specimens, of about 70 or 80 species, labeled with scientific names and the common names in the islands or provinces from which they were collected. From the tops of these logs up to the eaves, the entire walls were lined with a series of over seventy 3-meter planks, polished and unpolished, showing about forty species of woods, principally of kinds well known in commerce. The species represented by these logs and planks together—about 100 in number—amount to only about one twenty-fifth of the known tree species of the Islands.

Of manufactured wood products, there was a good assortment of narra, tanguile, and other furniture, loaned by various firms and individuals, as well as various one-piece table tops and other articles belonging to the Bureau of Forestry. Some of these were unfinished, some polished in natural colors, and others finished in various stains.

The collection of minor forest products included such articles as copal resin, gutta-percha, rattans, bamboos, hagnaya, brooms, dye bark, soap bark, etc.

The front entrance of the building was a great gateway formed of heavy timbers and rough palm logs, surmounted by a huge illuminated sign of bamboo letters mounted on a single piece of ipil 1 meter wide by 8 meters long. The entrance was flanked on both sides by logs of calantas (cigar-box wood) and broad planks of narra, banuyo, molave, pagatpat, dungon, malambingan, and narig.

The display of Dipterocarps (the woods of the Lauan family) occupied the entire north wall inside the exhibit and the south side of the exterior. Planks were shown of palosapis, apitong, red lauan, tanguile, mangasinoro, and almon (white lauan), mangachapuy, yacal, and guijo, ranging from 15 to 114 centimeters in width.

The main idea in giving the Lauan family so prominent a place was to combat the notion, so prevalent the world over, that the bulk of a tropical forest consists of the very hard and durable woods. This belief is erroneous as regards any part of the tropics, and in no place more so than here. The best single instance to illustrate its untruth is the fact that yacal, the most plentiful of the very hard woods in the Islands, is the least plentiful, at least here, of the Dipterocarps, the greatest timber family of the Indo-Malayan region.

The whole exhibit, except the loaned articles, will be installed permanently in the Museum at No. 158 Calle Anloague, Binondo, Manila, which will be thrown open to visitors about the middle or end of March, 1910.

BUREAU OF SCIENCE.

The Bureau of Science exhibit was particularly suggestive of possibilities in the future of the Philippines. The division of mines displayed, among other things, a model of a mine, showing the methods of working. A mineral relief map of the Islands, the work of I. Reyes and R. Nostrates, of the School of Commerce, indicated the location of the various minerals by means of colored flags, and relief maps of Mayon Volcano, Batan Island, Aroroy, Mancayan-Suyoc and Benguet mining districts, also the Compostela and Davao coal fields were shown together with the published maps from which they were made. A wall map showed the distribution of coal in the Islands, and there were samples of the product from Surigao, Cebu, Antique, Albay, Infanta, Misamis, Sorsogon, Iloilo, Mindoro, and Mindanao.

Rickeries of gold-bearing quartz from several mines were exhibited, and gilded bars indicated the increase in the gold production of the Islands from year to year. Iron was represented by a heap of black hematite iron ore from the Hison mine in Angat, Bulacan Province, donated by Doña María Fernando; this was accompanied by plowshares and other articles manufactured from the smelted ore. Collections of minerals in cases, samples of guano from the bat caves of Tayabas, and samples of petroleum from Cebu and Tayabas completed this branch of the exhibit.

The contribution from the chemical division consisted mainly of samples of various oils, arranged in groups. These included specimens of oil of turpentine, balao, resin, and elemi varnish, ocimum, ginger, vetiver, lemon-grass oil, ylang-ylang and cananga, blumea or sambong and lantana oil, native cinnamon-bark oil, coconut, peanut, and sesame oils, and canarium, candlenut, and kapok oils. Each sample of oil was accompanied by an herbarium sheet, showing the character of the tree or plant from which it is obtained. Other features were drugs and dyestuffs, copal and other gums, champaca flowers, cinnamon bark, and cassava.

In the silk exhibit the life of the silkworm was shown in all its stages, from the egg to the finished cocoon. Hanks of silk of various grades and colors were exhibited in cases, some being from the Philippines and others of Chinese origin. With these were fabrics made entirely or partly of silk—mainly of native manufacture. One card contained twelve samples of silk goods woven in the Islands and colored with native dyes.

The division of fisheries was represented by mounted specimens of fish, sponges in all stages, "pearl" buttons and the shells from which they are made, and coral from Davao.

BUREAU OF PUBLIC WORKS.

The exhibit of the Bureau of Public Works consisted almost entirely of photographs of irrigation structures and irrigation methods. These photographs showed the nature and extent of irrigation structures in India, Egypt, Java, and the Philippine Islands. For the most part they were collected by Mr. J. W. Beardsley, former Consulting Engineer in Charge of Irrigation Work, while on a trip through the above-mentioned countries for the purpose of investigating irrigation methods. There were among these pictures photographs of the local methods of thrashing rice and of plowing and harvesting the rice crops. Two tabular statements were given showing the

importation and exportation of rice from the different countries of the world, so that the comparison might be made of the standing of the Philippine Islands as a rice-producing nation.

A steel headgate manufactured in the Philippine Islands by the Atlantic, Gulf and Pacific Company was also exhibited. To date more than 100 of these headgates have been purchased by the irrigation division. These gates are so arranged that they may be raised or lowered any distance desired, so that the amount of water in the canal may be controlled. They may be located at any point and can not be interfered with. They are usually placed in concrete and are very firm and durable. With proper care one of them should last from fifty to seventy-five years at the very least. A steel headgate of the type shown is a very necessary article on Philippine irrigation canals. Nearly all of the canals in the Philippine Islands are of a primitive type and there has been no attempt to control the water running in the canals. As a result the canal banks have been damaged by excess of water and a great deal of water has been wasted which might have been used later for irrigation purposes. It is to be hoped that a few years' time will see all the irrigation canals in the Philippine Islands under positive control, so that water may be diverted or not according to the needs of the irrigator.

The exhibit of the irrigation division was descriptive of the beginning that the Government has made in the construction of irrigation systems, and as the work goes forward there is no doubt that each succeeding Carnival will see a larger and more instructive exhibit on irrigation construction and irrigation methods.

BUREAU OF INTERNAL REVENUE.

This exhibit was made for the purpose of introducing denatured alcohol to the attention of the public consuming it industrially for light, heat, and power. The superior illumination noticeable was from lamps burning denatured alcohol. Stoves, flatirons, and other implements of domestic use burning alcohol were contributed by various firms of Manila in order that their value might be demonstrated to the public. A gasoline engine taken from a launch of the Internal Revenue Bureau and installed as a stationary engine in the exhibit, was utilized to furnish power for the silk-reeling machine operated by the Bureau of Science in the adjoining exhibit. No special preparation or change was made in this engine and it worked satisfactorily throughout the period of the Carnival.

The opposite side of the exhibit was given over to showing the development of the alcohol industry in these Islands from the passage of the Internal Revenue Law in 1904. Examples were given of the ancient *caua* found in almost universal use at that time, there being some 400 so-called distilleries then operating. In 1907, after two years of work and practical demonstration, the distilleries of the Philippines were all induced to use a modern equipment for distilling, and working models of the present equipment were shown with photographs of various types of distilleries and equipment, and of the nipa and coco regions in which alcohol is manufactured. In 1905, with nearly 400 distilleries in operation, there were distilled 5,483,690 proof liters (1,448,626 gallons) and the tax collected was ₱1,096,738. By 1909 the number of distilleries had been reduced to approximately 60, all under modern conditions, and there were produced 11,252,155 proof liters (2,972,841 gallons), and the tax collections therefrom amounted to ₱2,250,451. There is not much doubt but that the investment of foreign capital in the sugar lands of the Philippines will give a great impetus to the production of industrial alcohol, as the establishment of "centrales" will afford opportunity for using the by-products of the cane in the process of sugar making for the distillation of alcohol.

BUREAU OF NAVIGATION.

The exhibit of the Bureau of Navigation at the Philippine Carnival may be divided into three main features: First, that representing the navigation division of the Bureau; second, the light-house division; and third, the division of port works.

The display of the navigation division consisted of a model of a coast-guard cutter, of which the Bureau now operates thirteen, and of models of the lines of ketches, whaleboats, cargo boats, lifeboats, etc. In the early days Bureau cutters were used principally for coast-guard work, but recently their chief occupation has been to operate over commercial routes, giving passenger, mail, and freight connections between the more isolated and larger ports of distribution. This method of developing trade through the Islands is still being carried on with satisfactory results, and when a route becomes sufficiently developed to warrant the operation of a commercial boat over it, the Bureau of Navigation withdraws its vessel and turns the route over to a commercial firm.

The marine railway and repair shop of the navigation division of the Bureau has met with very satisfactory results in the

construction of small craft, such as sailing sloops, motor boats, and lifeboats, small models of a number of which were on exhibition.

Perhaps the main feature was the exhibit of the light-house division, which consisted of a display of first order, fourth order, fifth order, and several sixth order lights, in addition to samples of clockwork, lenses, and a model of Lauis Ledge light station, which is under construction and will probably be put in operation within the next few months. The first-order light exhibited at the Carnival was placed at Capon, Grande Island, on the west coast of Luzon, a few miles north of the entrance to Subic Bay, in the early nineties, by the Spanish Government, at a cost of approximately ₱80,000. A first-order light with an ordinary wick burner placed at a sufficient height above the sea level will throw a flash under ordinary weather conditions about 40 miles and under some conditions it would be visible at even a greater distance. With an incandescent burner the arc of visibility would still be increased. The fourth-order light exhibited at the Carnival was recently purchased at an approximate cost of ₱10,000. This light, as soon as funds become available, will be placed at Point Flechas, on the east coast of Palawan, where it will be visible some 15 or 20 miles. The fifth-order Universal light displayed is a light which is held in Manila for emergency requirements. It is so constructed that it is adaptable to replace any light which may become out of order or which may be placed under repairs. A sixth-order light is usually placed so as to have a range of from 12 to 18 miles and is the type of light, with the exception of lens lanterns, most commonly used in the Philippine Islands. Lens lanterns are used mostly as port lights, indicating entrances to harbors, ends of piers, jetties, sea walls, etc. The model of Lauis Ledge light is the model of the sixth-order flashing light. This light is in course of construction in Cebu Harbor and when completed will represent an expenditure of some ₱8,000.

The Archipelago is made up of a thousand or more islands, some of which are merely small reefs, which makes it imperative, in order to properly safeguard navigation at night, to maintain an up-to-date light service. At the present time there are in operation 139 lights, 53 beacons, and 125 buoys. The exhibit at the Carnival of 1910 indicated only in a small way the extent of the light-house service of the Philippine Islands, yet apparatus to the amount of over ₱100,000 was displayed.

The third feature exhibited at the Carnival was that of the division of port works. The model of the steel wharves exhibited

was a sectional view of the new steel wharves recently constructed at the port of Manila at a cost of over ₱1,200,000. The use of these wharves with railroads running down to deep water will undoubtedly make Manila the cheapest port for handling cargo in the East. The model of the Iloilo wall showed the improvements that are under way in Iloilo wharfage facilities. The project for the improvement of this port will represent an investment of nearly ₱2,000,000 and a saving in cargo handling of about ₱315,000 per annum.

Under the supervision of the division of port works of the Bureau of Navigation much is being done toward deepening rivers and harbors, building wharves, etc., all of which will result in a decreased cost in cargo handling and a great assistance in the commercial development of the Philippine Islands.

BUREAU OF PRINTING.

The Bureau of Printing exhibit occupied a separate building, to the left of the main gate as one entered. The pavilion style of the building, with railings, enabled the sightseers to view the exhibit from all sides. The hours of operation were from 4 to 11 p. m. and the crowds that continuously lined the railings interested themselves in observing actual production by old and new methods. Alongside the old style of hand-feed platen printing press, printing sheets at about 1,200 an hour, was a modern automatic-feed printing press delivering 12,000 printed sheets an hour. Typesetting by hand as compared with a modern typesetting machine was an interesting demonstration of the wonderful strides made within the last few years in the printing trades. The old method of sewing books by hand and the new method of sewing them by machinery attracted considerable attention.

Beside a demonstration of the old and new methods of operations in typesetting, presswork, and bookbinding, employees of the Bureau were executing all the specialties of book finishing, photo-engraving finishing, and electrotype finishing. The various stages of a half-tone plate and of an electrotype plate were shown by samples above the finishers. On a shelf back of the book finishers were arranged samples of all styles of bindings, from pamphlet to full russia leather with extra hubs. There were books bound in full levant morocco with decorated edges of gold and the sides and back beautifully hand tooled, one book in particular showing a human face in relief gold; others with floral and gold designs. These beautiful bindings

were executed by Filipinos who were taught by an American craftsman instructor.

This exhibit presented an excellent idea of what has been accomplished by the Bureau of Printing by the proper instruction and supervision of Filipinos in the numerous specialties which enter into the production of a book. The work of the Bureau is almost wholly done by Filipinos under supervision of American craftsmen instructors.

BUREAU OF EDUCATION.

Division superintendents and teachers especially will be interested to know that the Bureau of Education made a good showing at the recent Carnival in Manila. The exhibit occupied three buildings, the larger structure, containing the provincial exhibits, was erected by students of the Philippine School of Arts and Trades and was the most substantial building on the Carnival grounds. The schools of the city of Manila made a very excellent showing in a working exhibit of lace and embroidery making, hat weaving, and domestic science. Shipments from the provinces came in such large quantities that only the best articles could be shown. The work of the trade schools was represented in a fine display of furniture.

The buildings were visited by great numbers of Filipinos and Americans, and the exhibits were heartily commended by everyone. Thousands of people by this means gained a new and more correct conception of what the Bureau of Education is doing along industrial lines. The following is a summarized report of the exhibition by the Bureau of Education:

Number of separate exhibitions	33
Number of articles exhibited	677
Approximate value of exhibition	₱10,428.86
Total number of articles sold	2,648
Total value of articles sold	₱3,707.28
Total number of articles returned	3,864
Approximate value of articles returned	₱6,570.27
Number of articles lost or unaccounted for	238
Approximate value of lost and unaccounted for	₱151.31
Number of unidentified articles in storeroom	59
Approximate value of unidentified	₱50.00

THE PROVINCIAL EXHIBITS AT THE CARNIVAL.

By far the largest number of provinces that have ever taken part in the Philippine Carnival took part in the agricultural and industrial exhibit this year. Ten provinces, namely, Bulacan, Rizal, Pangasinan, Pampanga, Iloilo, Cebu, Albay, Moro, Ilocos Norte, and Misamis, had on exhibition specimens of the products from their farms, shops, and factories.

BULACAN.

One of the most interesting industrial exhibits at the Carnival was that of Bulacan. Perhaps the leading feature of this exhibit was the large variety of hats from the town of Baliwag. These hats are made in many shapes, colors, and designs for ladies and gentlemen and some of them are of very fine workmanship; they range in price from ₱3 to ₱40. Beside the hats there was quite a variety of ornamental baskets, wall pockets, flower baskets and imitation flowers of many classes, also toy houses for children, a large number of baskets, straw chinelas, and an interesting collection of beadwork baskets, wall pockets and centerpieces made of a seed popularly known as "Job's tears," some very interesting samples of silk handkerchiefs made in the town of Baliwag, several samples of jusi and sedalina, and wall mats with pockets for fans, pictures, or other small articles.

There were many samples of different kinds of bejuco, small samples of about sixty different kinds of woods grown in the province, and quite a large collection of furniture made from bejuco which was worthy of notice. Portieres made from small pieces of *katigbí* (Job's tears) and bamboo were exhibited, and a variety of large and small picture frames made in Malolos and San Miguel, which showed considerable artistic ability.

In addition to these there was exhibited a large collection of different varieties of rice, corn, and other grains grown in different parts of the province, also samples of wines, liquors, and nipa tuba manufactured in the town of Hagonoy, which is located in one of the largest nipa sections in this province.

There was an interesting collection of the different kinds of

pottery made in the towns of San Rafael, Angat, and Calumpit. There were also samples of mineral waters from Sibul and Norzagaray; some of these waters are already noted for their medicinal value and Sibul is fast becoming popular with those troubled with stomach and bowel diseases, who find health from drinking the water and using the baths at this place.

Another interesting exhibit consisted of a variety of knives, bolos, and pruning knives manufactured in the towns of Angat and Meycawayan. The town of Angat is noted for having the only iron mine which is being worked in the Philippine Islands, and it should be further noted that the owner and manager of this mine is a women, Doña María de Fernando. There were a number of samples of native plowpoints and moldboards made in the factory of Matías E. Fernando and several baskets containing samples of iron from Angat, a small sample of almaciga, and a variety of floor, wall, and bed mats or petates.

RIZAL.

One of the first things in the Rizal exhibit to catch the eye of the visitor was the miniature representation of the "Hacienda Remedios" in the town of Montalban, owned by Sres. Sampedro and Manahan. This representation was intended to show on a small scale some of the physical features of the hacienda and the variety of farm products which are raised on it. In this miniature hacienda was a representation of the cave and the irrigation system, the water for which is furnished by the Manila waterworks, plants of corn, rice, tobacco, gabi, camotes, tuguí, cassava, uve and gogo, which is used by many of the native people for cleaning the hair in place of soap—a very satisfactory variety of plants which, if they can be successfully raised, should bring good profits to the owners of this plantation.

The remainder of the exhibit from the town of Montalban consisted principally of a large wooden tub or bowl for washing clothes, samples of kaolin, almaciga, gogo, also nito, sangumay, and bejuco, which are used in making hats, mats, etc., and a collection of large bejucos used in making chairs and furniture.

Other noticeable exhibits from this province were pilones and bayones for native sugar which are manufactured in San Mateo, and some good samples of bamboo grown in the same town. Beside the exhibits of sugar and sugar cane was a sample of a mammoth bamboo, also small samples of hemp, raised in the town of Mariquina. While this hemp was very white and apparently a good variety, it is much shorter than the most common

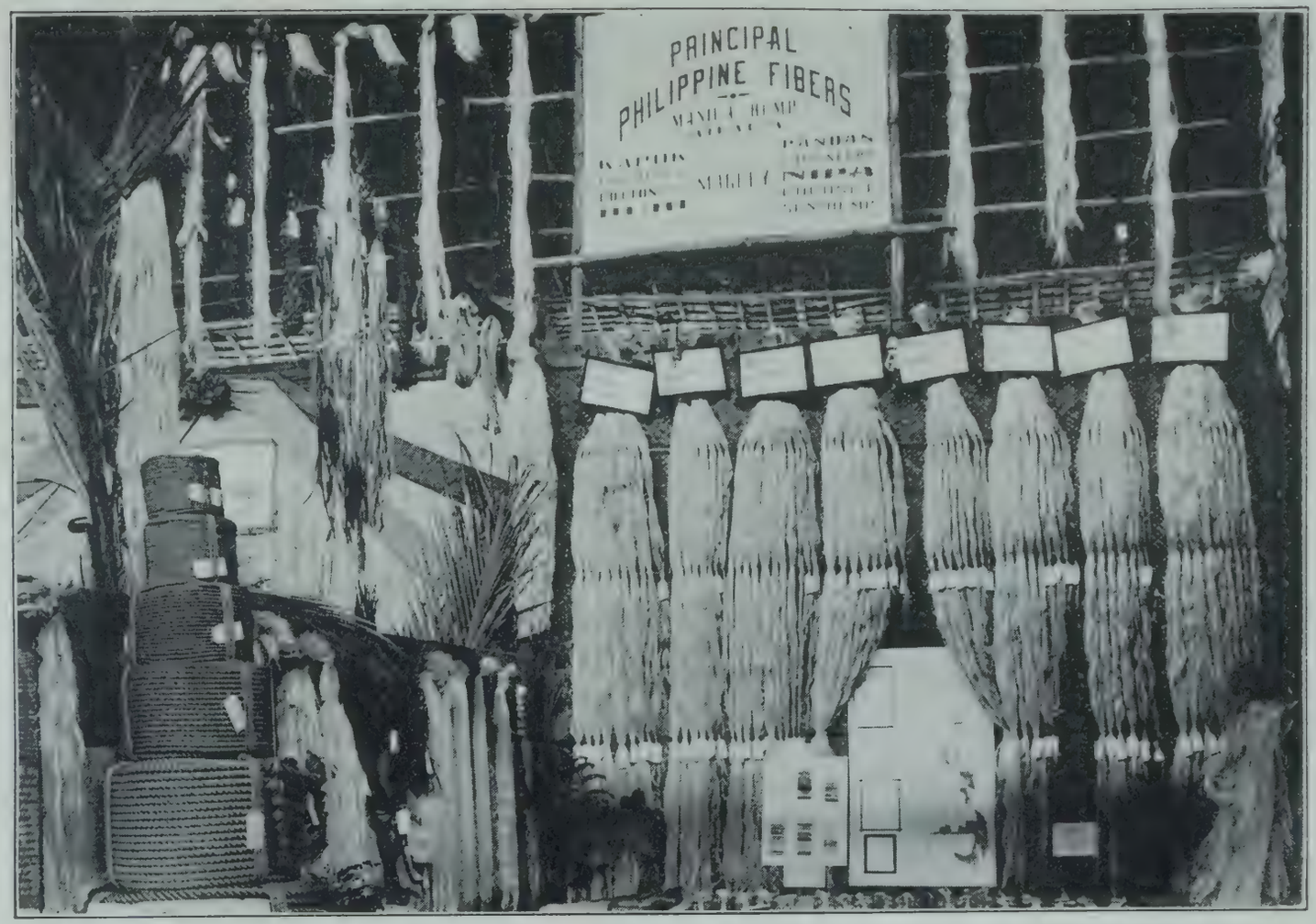

PLATE IV.—FIBER EXHIBIT OF THE BUREAU OF AGRICULTURE.

varieties grown in the hemp sections of the Islands. Other products produced in San Mateo were some samples of tobacco leaves, corn, tomatoes, beans, eggplant, also a sample from the tanato tree; this bark is also used for rope and other purposes. Besides these there were some samples of the handiwork of young ladies of the town. Many varieties of rice which are raised in the different towns of the province were shown, some very good samples of crude and refined sugar manufactured at the Luzon Sugar Refining Company's factory in Navotas, and some samples of salt gathered from the many salt beds in the town of Parañaque. In addition to these there were samples of hats made of sabutan from Pililia, some mats from Tanay, one of the most interesting of which was made in colors to represent the American flag, and very pretty samples of jusi and sedalina.

PANGASINAN.

One of the best exhibits to show the varied resources of a single province was that of Pangasinan. This exhibit contained, first of all, samples of about a hundred different varieties of rice grown in the province. It is well known that Pangasinan is the second largest rice-producing province of the Islands. In 1908 this province sowed 115,000 hectares and harvested 1,080,000 cavans of rice. There were also samples of something like 75 or 80 varieties of woods grown in different parts of the province.

One of the most interesting divisions was that of the hats, petacas, etc., made in Calasiao and neighboring towns. Calasiao, next to Baliwag, is noted for the manufacture of the best hats made in the Philippines. For many years the people of Calasiao have been engaged in this industry, and the hats made there are used not only in practically all parts of the Philippines, but many of them are shipped to foreign countries, where there is a growing demand for them. These hats are made mostly of nito and buri, and range in price from 50 centavos to ₱50. The exports of Philippine hats amounted to ₱337,044 for the fiscal year ending June 30, 1909.

There was also an interesting collection of *basi* and other wines made from nipa and sugar cane. Pangasinan, like Bulacan and Capiz, has one of the largest nipa industries in the Philippine Islands. This industry promises a large income to those interested in it providing the product can be utilized in making denatured alcohol. In this connection the very interesting exhibit by the Bureau of Internal Revenue showing the different uses of denatured alcohol for heating, cooking, and lighting purposes, also as a motor power for running small

engines, seemed to demonstrate its utility beyond a question of doubt. Under such conditions it seems to be altogether likely that the nipa factories which have been for some time almost abandoned may be put in operation again and become one of the leading industries of the Islands.

There were also many models of tools, fish traps, samples of pilones, small stoves, pieces of pottery, and a number of specimens of needlework. There was an interesting collection of different kinds of seeds of plants, such as mongos, sitao, çacao, calabasa, pepino, amargoso, mostasa Filipina, haba, tomatoes, frejoles, native lemons, calabasa redonda, sandía, patola, tamarind, berengena, ajonjoli blanco, corn, pepper, upo, camote, uve, gabe, tuguí, melons, bucacao used for food the same as rice and corn, algodon, batao, several samples of corteza de samac, samples of maguey fiber, also fibers of baroy, collot, and linao used for making ropes, which are grown in various parts of the province; and native woods such as banabá, paranopin, narra, sagat-molave, bolalaubien, lim-manca, canela, canomey, lanoté, and acle. There were also several samples of leaf tobacco and copra and rope manufactured in Lingayen. Besides this there were some very good samples of different kinds of stone for building purposes available in this province, and some samples of kaolin, one of which was almost pure, others containing considerable deposits of iron which gave a reddish color. Samples of copper ore, resin, and almaciga were exhibited from the town of Umingan.

This exhibit was made very attractive by the distribution of fine large photographs of the principal provincial buildings throughout Pangasinan; amongst these might be mentioned the San Carlos municipal school building, municipal school of Binmaley, the Bayambang intermediate school, the municipal school of Dagupan, the municipal school of San Fabian, and the intermediate school of Binalonan, the schoolhouses in San Carlos and Tayug, views of some of the best bridges and public works, such as the Pao-Umingan Road and the Lingayen-Camp One Road. Many of the exhibits from this province were from the Hacienda "La Esperanza" of Matías and Joaquín González which includes land in the towns of Santa Maria, Umingan, San Quintin, Rosales, and Santo Tomas. This plantation is said to be the largest in the Philippine Islands.

PAMPANGA.

The most complete and satisfactory exhibit of all the provinces was that of Pampanga. One of the first things noticed by visitors to this exhibit was a table approximately 8 feet in diameter made from narra, the property of Mr. José Piñon, of

Guagua; this was a part of a very notable collection of furniture manufactured in Pampanga, perhaps the best of its class manufactured in the Islands. It consisted of parlor chairs, vis-a-vis, *confidentes*, settees, office desks, upholstered chairs, and a beautiful writing desk made of nanca, the property of Dr. Felino Simpao, valued at ₱250. These pieces were made mostly of sandalo, aguso, and molave woods. There were many interesting samples of rustic furniture for use on porches, in yards or lawns, also a large variety of frames for pictures, made of bacauan and malabutol-aso.

A most interesting model in this exhibit was that of a small engine made by Mr. Juan Reyes, 16 years of age. This young man has made many devices, amongst others a model of a small launch; he has now been taken in charge by a well-to-do patron, who has placed him in the school of arts and trades in Bacolor, Pampanga. There were also some interesting specimens of engravings, and work in tin, which included a model of a very novel coffee pot, *cafetera*. In this section of the exhibit was a collection of artificial fruits, such as papayas, bananas, ciruelas, chicos, granadas, guayabas, lolomboy, lanzones, casuy, tarante, mangoes, atis, and camachile, which showed a great deal of artistic ability in this line of manufacture.

The agricultural exhibit of this province was decidedly the best provincial exhibit on the Carnival grounds. It included small sheaves and bags of rice, bags and pilones of sugar, and piles of corn in such quantities as to indicate the importance of these plants in the agricultural work of the province, which is one of the first agricultural provinces in the Philippines. These exhibits included white squash, sincamas, yellow and green squash, peanuts, celery, sweet potatoes, ampalaya, eggplant, repolio, arrowroot and flour made from the same, uve, many varieties of citron, tobacco leaves, cacao, patola, oranges, native lemons, peppers (red and green), beets, beans, pomelos, cacao seed, pineapples, bonga, violeta, and bejuco. The back wall of this exhibit was lined with stalks of sugar cane from Pampanga Province; upon this background the letters of the name of the province were made out of ears of yellow corn.

An aquarium containing wild ducks and fish was a novel feature. It is said that these ducks are found in large numbers on the Pinac or Lake of Candaba, which forms a part of the east boundary of this province, separating it from Bulacan. It is about an hour by boat from Mount Arayat, one of the most beautiful landmarks in Pampanga Province.

The remainder of this exhibit was arranged in sections. In

one of these sections was a native loom used to demonstrate the method of making native cloth, which is one of the principal industries in the town of Macabebe. In another section was an interesting exhibit of clays and pottery manufactured in the town of Apalit. Another section contained a very creditable exhibit of the bread, cakes, and confections of the Apalit bakery; still another section contained wall pockets, baskets, ornaments, portieres, etc., made in the same town, also a very valuable collection of jusi and rengue cloth from the town of Angeles. The last of these sections contained an exhibit of nipa products, alcohols and liquors, and a collection of nipa for roofing and house building by Ayala & Co. from their nipa hacienda in San Esteban, Macabebe. There were also samples of charcoal, sacks of lime, and bundles of sapan and wood used for making coloring matter or dyes, and many samples of hats, petates, bayones, and bolos manufactured in the town of Apalit. The whole exhibit was well arranged and the progress of the province was well presented by numerous photographs of the principal provincial and municipal buildings and improvements, such as the provincial government building, the provincial jail, the provincial school buildings and the municipal market of San Fernando, photographs of bridges and other public works, also pictures showing the manner of harvesting, transporting and milling sugar cane. Another industry in this province which is worthy of mention is the manufacture of guitars, mandolins, bandurrias, etc.

ILOILO.

An excellent exhibit of the products of its leading industries was shown by Iloilo Province. Representing the agriculture of the province there were a large number of varieties of rice, cacao from Pototan, *balatong* and *cadios*, a food product from Passi and Calinog, luya (a medicinal tuber), white and yellow squashes, citrons, camotes, uve, pomelos, corn, mangoes, and kapok or tree cotton which is grown near Passi and in other sections of the province. Beside these there were 35 packages of leaf tobacco which were raised in the province. Tobacco cultivation is said to be the second important industry in the province. There are large areas of good river-bottom land which are now uncultivated for lack of capital and farm animals. The Compañía General de Tabacos de Filipinas is the only house buying the tobacco of the Iloilo farmers. While Panay tobacco is said to be second quality, it is believed that it can easily be made of first quality by giving the necessary attention to the cultivation and care of the plants. The people of Iloilo Province are enthusiastic over the

prospect for this industry, and they invite those who have capital to invest and are interested to investigate the opportunities for tobacco cultivation in the province.

One of the leading industries in Iloilo, as in the provinces of Negros, is growing sugar cane. The exhibit contained some fine samples of sugar, also some excellent illustrations showing gang plows and engines in operation preparing the soil for planting and some fine views of cane fields in different sections of the province; this division of the exhibit also contained some very good specimens of two kinds of sugar cane, white and red, which were apparently of excellent quality; there were also some views of sugar mills in operation, which make a striking contrast when compared with the modern mills now in use in Hawaii and Formosa.

A number of samples of a fine grade of hemp, articles made from hemp fiber, a sample of "anabo," a kind of fiber used extensively in making cheap twine and rope, were also on exhibit.

By far the most attractive feature of this whole exhibit, to the ladies at least, was the remarkable collection of native textiles woven on hand looms in the towns of Miagao, Guimbal, Leon, Jaro, and Tigbauan. The Island of Panay is noted for its weaving industry; its jusi and piña cloths are probably the finest made in the Philippines. However, it might be stated that this industry is not confined solely to Iloilo Province, as Calivo and other towns of Capiz Province, also some towns in Antique, have produced on their looms fully as fine quality of jusi and piña as any of the towns above mentioned. The exhibit of the different classes of these fabrics—jusi, piña, sinamay, silks, laces, etc.—was the most complete on the Carnival grounds and contained the largest variety of the highest grade of native woven goods made anywhere in the Philippines. These cloths varied in design from the simplest pattern to the most varied and intricate designs in flowers and colors that one could use or wish for. As a part of this exhibit were four hand looms from Iloilo, Jaro, Arévalo, and Miagao which were operated during a part of each day, showing the method of making the cloth.

Closely related to the textile industry is that of hats and mats, which is quite an important occupation with the people in the towns of Pototan and Passi in Iloilo Province and Dumarao in Capiz Province. These hats, mats, and petacas are made mostly of buri, nito, and tayok-tayok (sabutan) fiber.

One of the features of the Iloilo exhibit which is worthy of

mention was the exhibit of the Jaro Industrial School Republic. This contained a number of useful articles which were well made and durable.

CEBU.

The exhibit from the Province of Cebu consisted principally of a number of very good samples of hemp from the towns of Cebu, Compostela, Argao, Carcar, Ginatilan, and Danao; samples of maguey from the towns of Simalao, Sibonga, Balamban, Liboan, Maslog, Compostela, Danao, Naga, Ocaña, San Fernando, Bago, and Valladolid; samples of rope made of maguey fiber, samples of kapok, tree cotton, from Talisay, Mandaui, and Valladolid.

There were samples of about 20 different kinds of wood found on the Island of Cebu, among which are ipil, pagatpat, balitanan, lumbayao, balamansanay, mangachapoi, almontanguile, narra, yacal, molave, yellow narra, lauan, apitong, guijo.

There was also a large number of samples of different kinds of rice and corn raised on the Island of Cebu. It might be noted that corn has perhaps been more successfully and extensively raised in Cebu than in any other province in the Philippines. There were samples of copra, and sugar made from sugar cane raised in Cebu, peanuts from Valladolid and Ocaña, cacao from Naga, mangoes and castor oil beans from Valladolid and Ocaña, a sample of almaciga (gum copal), samples of *panol tangog* bark from Sangat used for coloring tuba, and coal from the mine near Danao on the Island of Cebu. A notable feature of this exhibit consisted of about 50 large packages of leaf tobacco which had been raised in Cebu. Tobacco growing is one of the most important industries on this island.

ALBAY.

The exhibit of this province consisted mostly of samples of fibers, several bales of hemp, and fiber-stripping machinery; three models of Behrendt hemp-stripping machines made by the Watson Company were on exhibition. Hemp raising is the leading industry of this province and it should also be stated that Albay is one of the most important hemp-producing provinces in the Philippines. According to the published report of the Manila Chamber of Commerce Albay furnished 548,194 piculs of hemp to the Manila market in 1908—more than one-third of the whole product—while the next largest shipment from any one province was 318,059 piculs from the Province of Samar.

There were samples of coal from the East Batan mine on the

Island of Batan. The importance of Albay's coal mining industry can hardly be estimated at this time. This coal is now being used by several different Manila firms, by the Quartermaster Department of the United States Army, and others. Regular shipments are now being made to Manila and there is already some demand for Batan coal in foreign ports.

The exhibit included some samples of rice raised in Albay, a model of a rice mill run by water power, a number of interesting samples of pottery, and some furniture. There was also a large variety of native cloths which are woven in different parts of the Province of Albay, such as pinolpog, made in Legaspi, and sinamay made in Daraga, Albay, Legaspi, and Camalig. In this exhibit also a native loom was in operation, demonstrating the method or making sedalina, a cloth made of jusi and silk threads with a satin finish.

MORO.

The exhibit of this province was arranged in groups from the subprovinces or districts of Davao, Cotabato, Lanao, Zamboanga, and Sulu. These exhibits were composed largely of Moro shields, helmets, spears, brass, bolos, creeses, barongs, campilans, Moro cloths, etc.

The agricultural exhibit of the Moro Province consisted largely of hemp from Davao, which is noted for its length and whiteness, some fibers being from 17 to 18 feet long, and though it is much coarser than the same grades stripped in the same way from Albay, Camarines, and Sorsogon, there is a large demand for it on account of its length, color, and strength. Davao without doubt furnishes the strongest and best varieties of hemp grown in the Philippine Islands, and is justly noted for its hemp plantations and for the quality of hemp put on the market at that port. In addition to hemp, there were samples of beeswax, peanuts, almaciga (gum copal), and a fine collection of native woods placed on exhibit by Lyon & Co., which included the following: Balacbacan, malabingan, narig, calantas, lauan, lumbayao, ipil, narra, cubi pagatpat, tindalo, molave, mangachapuy, and dungon. There were also some excellent samples of a large variety of bejuco, four gigantic stalks of sugar cane sixteen months old, measuring 28 feet, and some coconuts. The Sulu exhibit contained samples of salt, almaciga, tree corral, peanuts, large stalks of sugar cane, and a number of samples of native woods which grow on the Island of Jolo.

ILOCOS NORTE.

The most striking feature of the Ilocos Norte exhibit was the samples of native blankets called binacol (sabana peluda) which are woven only in this part of the Islands. These blankets and the closely woven cloths have been for many years produced by the people of the Ilocos Provinces, and many of them are of superior quality. A fine collection of hemp and maguey textiles and cotton cloths, such as towels, table covers, etc., were on exhibit. In addition to the weaving industry, there were exhibits of a large variety of native woods, and samples of furniture made of bamboo, including beds, tables, chairs, settees, rocking-chairs, and some very well made trunks. The agricultural part of this exhibit consisted of samples of tobacco, rice, maguey, corn, peanuts, mongo, various kinds of melons and other seeds. There were also some very artistic specimens of handiwork in the form of fans, baskets, ornamental centerpieces, beadwork, etc., some native hats, mandolins, bandurrias, and guitars.

MISAMIS.

This very creditable exhibit from a distant province consisted principally of samples of hemp and other agricultural products raised in the province. Samples of rice, cacao, dawa, coconuts, copra, tobacco, and several varieties of coffee raised near Cagayan de Misamis were shown. In this exhibit there were also hammocks, petates, and a number of fabrics and pieces of hand needlework. Several looms were kept in operation a part of each day for the purpose of demonstrating the method of weaving native cloths. Native woods of the province were exhibited, also wax, gutta-percha, virgin wax, almaciga, and there was a very creditable exhibit from the Cagayan trade school, consisting of office desks, tables, chairs, bookcases, picture frames, etc., beside a great deal of similar material, such as baskets, fans, many varieties of wall pockets, chinelas, etc. Two hemp-stripping machines made by Vicente Reyes Barrientos, Nos. 8 and 9, were on exhibition.

THE THIRD ANNUAL EXHIBITION OF THE MANILA HORSE SHOW ASSOCIATION.

By Mr. Henry Birkett,
Vice-President of the Association.

The Manila Horse Show Association was started by Col. George M. Dunn and Capt. George Langhorne in 1908, and the first show was held in February of that year. The third annual show was held this year on February 6, 8, and 10. The association may now be said to have come to stay and undoubtedly more interest is being taken in the annual show year by year.

It is unfortunate that it is necessary to depend each year as the show time comes round on the generous support of some of the business houses, the clubs and private individuals in the way of cups for prizes, as the entry fees, membership fees, and gate receipts have so far been quite insufficient to defray expenses.

The association and show are undoubtedly a necessity to Manila, as I think it may be said without fear of contradiction that Manila and its suburbs contain as many horses in proportion to its population as any other city in the world. The object of the association is the improvement in the breed of horses in Manila and the Philippines generally, which it hopes to effect by means of the annual show. Undoubtedly the exhibits would not compare unfavorably with the ordinary horse shows in other parts of the world.

Generally speaking, the shows thus far have been entirely supported by Americans and Europeans, both as regards membership and entries, and undoubtedly the association has to thank the Tenth Cavalry for the success of the first two shows and the Twelfth Cavalry for that of this year. Each year five or six classes have been offered for Filipino ponies, but only one or two classes have been filled, and the entries for these were very poor. For some reason it seems impossible to persuade the Filipino public to interest itself in the show. Each year hundreds of schedules of the classes have been distributed over Manila and sent to the provinces, but, as already stated, without

any success so far as getting Filipinos to exhibit their ponies was concerned.

A new class was introduced this year, by the energy of the Society for the Prevention of Cruelty to Animals, for carromatas which plied for hire, and after a good deal of trouble on the S. P. C. A. 's part about 80 entries were finally made. As some 30 of these received money prizes, varying from ₱50 to ₱5, there should be a large entry in this class next year.

The association tries to interest every horse owner, and each year offers prizes for stallions, native and foreign brood mares, gentlemen's and ladies' hacks, combination horses, carromata ponies, pairs and single horses to victorias, roadsters, polo ponies, high jumpers, hunters, and classes for boys and girls.

Turning to this year's show, although numerically the exhibits were about the same as those last year, still the standards as a whole were certainly higher, and several blue ribbonists of last year, although shown in good fettle, had this year to concede the first honors to others.

The show opened with brood mares shown on a lead, a beautiful class won by Mr. W. V. Carter's Sis, a good mare, full of quality, beating Mr. Jones's Lulu and Tutu (full sisters), who were shown in excellent condition and who took first and second last year.

Gentlemen's hacks over 14.2 were a nice lot and the blue ribbon went to Mr. Chas. Aitken. A fine type of horse in Gen. William H. Carter's Tom Bass secured second prize, although perhaps more suitable for cavalry purposes than hack work. Foxy, the winner last year of this class, was shown, but in very poor condition.

The tandems again went to Mr. J. Garchitorena with his smart little team of grays. Mr. H. N. Cootes, aid-de-camp to the Governor-General, gave an excellent exhibition of driving, but was beaten for conformation and appointments.

Ladies' hacks under 14.2 was rightly won by Lieut. E. V. Armstrong's Kitty Winks (Thirteenth Cavalry), a nice quality bay mare and well shown.

A new pair to Manila, owned by Mr. B. F. Rahmeyer, easily won the phaeton class. This was a rare pair of trappers and fit to compete almost anywhere, although they were not shown in as smart condition as they might have been. They have excellent action and travel like clockwork.

The carromata class again brought out a large entry, and Mr. Juan Teus carried off both first and second prizes with Australian and Queen, beautifully turned out and well driven.

In the victoria class, Mr. J. Garchitorena was again to the fore with Ali and Aida, an undoubtedly smart turnout, but we preferred from the ringside both Rahmeyer's Bonnie and Beauty and Mr. Teus's smart black team, and should have placed them in this order. The carriages and appointments were all first class and fit to compete in any show.

The jumpers class was easily won by Mr. B. F. Rahmeyer's Aeroplane, a small pony just 14 hands, but beautifully ridden by Mr. K. T. Austin. He took everything as it came without a mistake.

Ladies' hacks over 14.2 went, and rightly so, to Mr. H. W. Butner's Denmark, well shown and ridden by Mrs. M. M. Talbot.

The combination class 14.2 and under brought out a really smart pony in Mr. Teus's King, who scored very easily. This is really a smart pony with excellent action, very good in front and clean all round. With better quarters he would win in any company. He also won the hack class 14.2 and under.

The stallions 14.2 and under brought out a large field, and it was a near thing between the Governor-General's Bay Arab and Dr. W. W. Richard's Silver Heels. The latter was shown in beautiful condition, but had to be content with second place.

Brood mares under 14.2 was quite one of the best classes in the show. The winner, Kitty Winks, a brown mare owned by Lieut. E. V. Armstrong, Thirteenth Cavalry, stood out from the other exhibits. She is an ideal brood mare, one of the sort that would mate with almost any type of stallion, and in her we have demonstrated the value of the thoroughbred sire as a producer of utility horses. She is undoubtedly full of thoroughbred blood, and while showing any amount of quality she has at the same time substance and bone to back it up. The second in this class, Juan Teus's black mare Queen, was a good showy type of mare but with faulty hocks. Among others that deserve mention were Mr. F. Lichauco's black, Mrs. A. G. Robertson's Goldie, and Mrs. Henry Birkett's Tryphosa.

In the stallion class an interesting exhibit was Capt. John E. Stephen's two-year-old colt locally bred, showing nice quality and more substance and bone than is usually met with in horses reared in this climate.

Mr. J. Teus was again first in the roadster class, owing to Mr. V. Fernandez' Ruch being overheight, and the same owner finished up the show by taking the speed class with Non-plus, a fast trotter, but lucky in beating Mr. B. F. Rahmeyer's Wonder.

THE FIRST PHILIPPINE LIVE-STOCK EXHIBIT.

By Prof. C. M. Conner,
Assistant Director of Agriculture.

The exhibition of live stock at the Carnival this year was, so far as we are able to learn, the first of its kind ever undertaken in the Philippines. The animals on exhibition at the Carnival grounds were not the best, nor the only good animals in the Philippine Islands—in fact, with two or three exceptions, they were all owned within the city of Manila—but they were well worth going to see, even though they had not been specially fitted or prepared for show.

Lack of sufficient advertising of this feature of the Carnival in time for owners to put their animals in condition for exhibition, the inability of the Carnival Association to offer substantial premiums, and the inadequate quarters, coupled with the entire novelty of the venture and a general fear of exposure to infectious animal diseases, all made it difficult to arouse the enthusiasm of live-stock owners in the show. A number were found, however, who were willing to go to considerable trouble, expense, and risk, with no hope of compensation, and so the live-stock feature of the Carnival was inaugurated, and there is no reason why it should not be continued and increase in interest and importance.

The Bureau of Agriculture was the largest exhibitor, presenting stock from the Alabang and Baguio stock farms, besides a number of fine Indian cattle which have recently been imported for experimental purposes. The latter included two cows with calves at foot, several other young cows and heifers, four large bullocks, and one large bull in excellent condition. Mr. Faustino Lichauco, of Manila, also exhibited some bullocks of this breed. The Indian cattle are creating considerable interest throughout the Islands and attracted much attention at the Carnival.

The cross-bred horses entered by the Bureau were probably the most interesting feature of the show. These consisted of

PLATE V.—MESTIZO COLTS BRED BY THE BUREAU OF AGRICULTURE.

eleven head of colts, representing several different crosses—products of American mares by native stallions, of native mares by American stallions, and of native mares by Arabian stallions. The Arabian-native colts show a quality and style that made them general favorites at the Carnival and promise great things for that cross. Some of the individuals of all the various crosses were exceptionally fine animals, and all of them showed advantages over the pure native stock, although in some cases no special selection of the parents had been made. The only other horses in the show were three Indo-Chinese ponies exhibited by Mr. Lichauco, which were interesting on account of their diminutive size, being little larger than a large dog.

Other exhibits of the Bureau were some pens of imported Maltese and Spanish goats, and a pen of native-bred and imported Berkshire pigs. Another pair of pure, native-bred Berkshires was presented by Mr. Eugene Wickham, of Santa Mesa.

Aside from the Bureau of Agriculture, Mr. Faustino Lichauco was the only large exhibitor. In addition to the animals already mentioned, he entered some unusually good Indo-Chinese carabaos which were probably among the best in the Islands, besides some plainer Chinese and native cattle, and two Devon bulls imported from Australia.

Mr. Mariano Mol, of Pasay, had an interesting exhibit of Indian carabaos, very few of which have ever been introduced into the Philippines. The exhibit consisted of two aged animals, male and female, and a calf. Mr. Verstockt, of the Philippine Trading Company, presented four head of cross-bred (Australian-native) bull calves from the Jalajala hacienda which were said to have been taken directly from the range and shown without any preparation. They were well above the ordinary native range-bred stock in form and size and were in perfect condition. These animals were sold during the Carnival.

As already mentioned, several obstacles were encountered by the committee in securing entries for the exhibit. Probably the greatest of these was the natural one due to the fact that a live-stock show had never before been held in the Islands; this has already been removed. Next year it should be much less difficult to attract the interest of the public and within a few years the exposition ought to become self-supporting through the people most directly concerned. The Carnival being an Insular institution concerns everyone in the Philippines, and a live-stock show in connection with it should include the best products from every part of the Archipelago. Some years ago

one of the largest associations in the United States adopted the plan of providing free feed for all entries while on exhibition and paying all return transportation charges from the exposition grounds. If some such idea could be followed here, in connection with small cash premiums or medals for the best entries, until sufficient interest is created in the undertaking to make it self-supporting, it is believed that this exhibit would take the place it should occupy much sooner than it will otherwise do.

In spite of obstacles, the live-stock feature of the Carnival can, and it is believed will, be made permanent and prominent as it really should, and from the beginning made this year, modest though it was, there is every reason to feel encouraged for the future of an Annual Live-stock Exposition. The following is a list of the premiums awarded:

Carabao.—Aged bull—Indo-Chinese: First, F. W. Carpenter; Second, Faustino Lichauco. Cow: First, Faustino Lichauco. Indian: Diploma, Mariano Mol, on pair.

Chinese work bullocks, trotting bullocks, and native cattle.—Diploma, Faustino Lichauco.

Devon (imp.) bulls.—Diploma, Faustino Lichauco.

Mestizo calves.—Diploma, Mr. Verstockt, Philippine Trading Company.

Indo-Chinese ponies.—Diploma, Faustino Lichauco.

Berkshire swine.—Boar and sow, 1 year old: Diploma, Eugene Wickham, 639 Sta: Mesa.

THE FIRST POULTRY SHOW IN THE PHILIPPINES.

By Mr. Harry A. Ireland.

Although there are numerous poultry fanciers and hundreds of good birds in and around Manila, no attempt has been made until the present year to institute a poultry show. Some time before the Carnival of this year an announcement was made that a poultry show would be made one of the features of the Carnival, and later a canvass of poultry breeders and importers was made to secure entries for the show. The result was not all that could be desired in regard to the number of birds presented, but the general interest expressed and shown, both by fanciers and the general public, promises well for future shows.

The exhibits this year did not represent all the good poultry in Manila. Breeders did not become interested in time to select and fit their birds for exhibition, hence many fine birds were kept out because just at Carnival time they were not in good condition, and a number of owners of good flocks did not feel that they were justified in going to the expense of entering their birds for the consideration offered. However, a creditable little show was made, and if those who did not exhibit this year will fall in line next Carnival with those who did, the Second Philippine Poultry Show will be such that the most critical must approve. More commodious quarters will be required than those of the first show, but if sufficient interest is expressed there is little doubt that they will be provided.

There were eight breeds represented this year, and while some of the individual entries could not be called typical of their respective breeds and very few of the birds were in show condition, the exhibition, in general, was good. Mr. Jack Jenkins, who was awarded first prize on his exhibit as a whole, showed an excellent group of Barred Plymouth Rocks, a pen of half-breed Black Minorcas, and a mestiza hen with flock of twenty Barred Rock chicks; Mackay and Darley won second premium with their display consisting of a trio of Silver-laced Wyandot hens, a pen each of Indian Games, Buff Orpingtons,

and wild fowl, and three pens of Bantams. Mr. A. L. Barden presented a good pen of Barred Rocks, some young cockerels of the same breed, and a pen of White Leghorns; Mr. W. F. Hogle, Mrs. Lucile F. Page, and Miss Mary H. Fee also entered a pen, a pair, and two hens, respectively, of the White Leghorn breed. This breed seems to be fast coming into favor here on account of its egg-producing qualities, and some good specimens were shown. Mrs. Page had the first prize Barred Plymouth Rock hen of the show, although she entered but two hens of the breed, and won first prize in the White Leghorn class with the only hen of that breed she had in the show. A class was provided for cross-bred birds, and in this Mrs. Page and Miss Fee divided honors, as shown in the premium list given below. Mr. Eugene Wickham showed a pen of Japanese Games and the Light Brahma breed was represented by two young cockerels.

Maj. George P. Ahern and Sr. Rafael del Pan acted as judges of the show, though there was but little competition in any of the breeds except the Barred Rocks and the White Leghorns. Prizes awarded consisted of ribbons and diplomas. It is hoped that next year cash prizes may be provided, for although exhibitors have expressed no anxiety in regard to the matter, it would undoubtedly increase the quality and interest of the exhibition. Below is a list of the premiums awarded:

Barred Plymouth Rock.—Pen: First (blue ribbon and diploma), Jack Jenkins, 80 Zurbaran, Sta. Cruz, Manila; second (red ribbon and diploma), A. L. Barden, 99 Dominga, Malate, Manila. Cock: First, A. L. Barden; second, Jack Jenkins. Hen: First, Mrs. Lucile F. Page, 348 Nozaleda; second, Jack Jenkins.

Mestizo.—Cock: First, Miss Mary H. Fee, 243 Leveriza, Malate, Manila; second, Mrs. Lucile F. Page. Hen: First, Mrs. Lucile F. Page; second, Miss Mary H. Fee.

White Leghorns.—Pen: First, A. L. Barden; second, F. W. Hogle, 88 (int.) Singalong. Cock: First, W. F. Hogle; second, A. L. Barden. Hen: First, Mrs. Lucile F. Page; second, W. F. Hogle.

Buff Orpingtons.—Pen: First, B. F. Mackay, 42 Escolta.

Indian Games.—Pen: First, B. F. Mackay.

White Bantams.—Pen: First, B. F. Mackay.

Best exhibit.—First, Jack Jenkins; second, B. F. Mackay.

PLATE VI.—PAMPANGA'S PRIZE EXHIBIT AT THE CARNIVAL.

THE FIRST PHILIPPINE DOG SHOW.

By R. D. Fergusson,
Vice-President of the Philippine Kennel Club.

Maeterlinck has said that "amid all the forms of life that surround us, not one, excepting the dog, has made an alliance with us. A few creatures fear us, most are unaware of us, and not one loves us." Dr. Woodrow Wilson recently advanced the very interesting and novel theory that the dog, instead of having been domesticated by man, had in the beginning "adopted man into his pack." However this may be, it is a fact that the dog not only plays an important part in the domestic economy of man as the guardian of his home, his flocks, and his herds, but is also the companion of many of his outdoor sports, helps to provide for his larder, is the favorite of the rich and the consolation of the poor and, as Kipling says, is man's first friend.

Ancient literature and folklore contain many interesting legends of the dog, and even the oldest cuneiform tablets are not wanting in reference to him. Hanauer, in his Palestinian Animal Folklore, tells the following old legend of the origin of the hatred between cat and dog:

> Once upon a time, when the world was young, to each and every kind of animal a duty was assigned. The dog and the cat were relieved from menial duty, because of the faithfulness of the one and the cleanliness of the other, and a written document was given them in attestation thereof, and the dog took charge of it. He buried it where he kept his stock of old bones, but this privilege of exemption so roused the envy of the horse, ass, and ox that they bribed the rat to burrow underground and destroy the charter. Since the loss of this document the dog has been liable, on account of his carelessness, to be tied or chained up by his master, and what is more, the cat has never forgiven him.[1]

In England and in America the cult of the dog is so firmly established that it is unnecessary to catalogue his many virtues and admirable qualities in order to draw a crowd of worshipers to Islington or Madison Square during the sacred Four Days

[1] Semitic Magic, by R. Campbell Thompson.

of the Dog. It was quite fitting therefore that here in transplanted America a fane should be erected to the dog, where devotees might turn aside from Carnival frivolities to do homage to man's faithful ally.

The Carnival Dog Show captured the public interest and from the start was a "howling" success. Everyone who saw it immediately became a convert and spread the fame of the dog sanctuary far and wide throughout the grounds. As a result the building devoted to *Canis familiaris* was thronged to its full capacity during the hours of exhibition and the show was universally voted the most interesting exhibit in the City of Momus. Nor did number outdo quality among those present. Bench and bar, society, Government, commerce, industry, and all other members of the community were well represented among the visitors.

Of the 189 distinct varieties of the domestic dog, 29 were exhibited at the Carnival Dog Show, as follows: Bulldogs, bull terriers, pit bull terriers, fox terriers, Irish terriers, black and tan terriers, toy terriers, harriers, Airedales, foxhounds, greyhounds, bloodhounds, deerhounds, collies, pointers, English setters, Llewellyn setters, water and cocker spaniels, St. Bernards, Pomeranians, chows; French, Spanish, and Chinese poodles; French bulldogs, chins, staghounds, and mastiffs. These varieties were subdivided into 39 classes, in most of which two prizes were awarded. Class 40 brought nearly all of the blue-ribbon winners into the judging ring and resulted in the award of a silver cup to Mr. Chas. A. McDonough's bulldog Arguide for the best dog in the show, and of a similar cup to Dr. J. A. McKinnon for his bulldog bitch Maggie for the best bitch exhibited. In addition to this, the following four prize-winning dogs were very highly commended in this class: Mr. John Kennedy's Airedale dog Dick, Mr. J. L. Prendergast's bull terrier bitch Lady, Mr. A. W. Yearsley's collie dog Silver Dollar, and Mr. Leonard Dyson's fox terrier Spot. The smallest dog exhibited was Mr. Max Drusiedt's Chinese poodle Gustav, which, though nearly two years old, was no bigger than a good-sized rat and would hardly have made a good mouthful for the largest dog exhibited, Mr. T. M. Beech's St. Bernard Duke.

One of the results of the dog show has been the organization of the Philippine Kennel Club, of which the Governor-General is honorary president and the Secretary of the Interior active president. The purpose of this club, stated in broad general outline, is to improve the quality and endeavor to reduce the quantity of dog life in these Islands. It will work for the general uplift of the dog. It will hold annual or semiannual dog

shows and offer prizes for the best exhibits. It will gather and distribute for the benefit of its members and of the general public useful information regarding the dog in health and disease. It will issue certificates of dogs registered by it. It will make every effort to have in Manila a market for blooded dogs where buyers from surrounding countries can buy dogs that have been bred to withstand the effects of the climate.

It is the general impression that the dog is an inhabitant of the cold and temperate regions and that he rapidly degenerates in the tropics. Undoubtedly this is true, but much can be done to overcome the effects of tropical conditions by careful and scientific treatment. It will be interesting to note the results of a series of experiments among the members of the club during a number of years in the treatment of disease and in the breeding and rearing of young puppies.

The greatest enemies of the dog in this country are external and internal parasites, which are preventable. Other causes of his rapid degeneration are lack of exercise and improper feeding. A little genuine sympathy for the dog in his afflictions and a little active help will perform wonderful results in ridding him of his enemies. There can be nothing more important than ridding him of intestinal parasites, and a dog should be given a proper dose of powdered areca nut, santonine, and castor oil and made to fast twenty-four hours after the dose, at the very least five or six times a year, whether he shows any evidence of having these parasites or not.

In breeding it is well to have in mind that the sire is mainly responsible for the external structure, configuration and outward characteristics, also the locomotive system or development, while from the dam the pups get their internal structure, vital organs, constitution, temper, and habits in a greater proportion than from the male parent. It is also true that the purer the race of the parent the more certainty there is of its transmitting its qualities to the offspring. The parent of the purer descent will have the greater influence; and apart from certain disturbing influences the male, if of pure descent and descended from a stock of uniform color, will stamp his color upon his offspring.

These conclusions regarding breeding were arrived at by an English breeder of the first rank and have been often quoted approvingly.

SILK CULTURE IN THE PHILIPPINES.

By Dr. Charles S. Banks,
Government Entomologist.

Few industries at the present time mentioned or advocated in the Philippines offer such inducement to the serious minded, who would at the same time find a safe method for employing a small amount of capital and a vocation which from its character is pleasant to follow, as the raising of silkworms and the subsequent conversion of the cocoons into a product ready for an immediate local market.

Unlike hemp, with the uncertainty of hands for its harvesting, the uncertainty of a disposition on the part of local buyers to purchase at a fair figure, the uncertainty of transportation from the more remote centers of production and the vastly more important uncertainty of a steady foreign market, the amount of silk which could be produced in the Philippines during the next score of years would find ready consumers in the makers of jusi and other native fabrics into the manufacture of which there enters annually more than ₱200,000 worth of raw silk, imported for the most part from China.

It is a well-known fact that silkworms and mulberry trees were introduced into these Islands some three hundred and seventeen years ago and that while the raising of silkworms died out more than one hundred and twenty-five years ago, the mulberry found the soil and climatic conditions so much to its liking that it has now become naturalized in all parts of the Islands and grows practically as an indigenous plant.

This plant does not require for its best development that quality of soil and that degree of cultivation which must be given to such plants as tobacco, coffee, rice, or sugar cane, and there are vast tracts of land in all parts of the Archipelago which are now lying idle and which could be profitably planted to mulberry, provided means were at hand for the irrigation of the mulberry plantations. The picture comes to mind of the extensive areas in Occidental Negros which can not be put to sugar

or hemp, but which would produce the finest quality of mulberry leaves.

Aside from the question of land, few legitimate industries in any country to-day require for their inception and maintenance a smaller outlay of capital than does silk culture. It is not the intention in this article to enter too minutely into the question of "kilos per hectare" or the relative cost of production in the various provinces or islands as influenced by the daily wage prevailing in given localities, but only to give some general idea of the average cost and profit based upon the experiment and practice here and elsewhere.

Mulberry trees may be planted 3 meters apart each way so that from 1,000 to 1,100 would occupy approximately 1 hectare, making allowance for rocks and other obstructions. Twenty healthy, robust trees two to four years old should feed from 30,000 to 40,000 silkworms. The cuttings should be made from trees which are not less than three years old, preferably from those of five years or more. These cuttings, which need not be over 3 decimeters in length, should be planted in nurseries and well watered, the best time for making and planting cuttings being just before the rainy season. As soon as the new shoots are 3 or 4 decimeters high the young plants may be set out.

It is not wise to manure ground on which mulberries are to be planted, as too much manure in the soil tends to make the leaves inferior for silk production.

If the soil be kept loose for a half meter around the trees and plenty of water be furnished during the dry season the plants will do well. The matter of tree planting is stated somewhat more explicity here as it is most important that we get a good plantation started before we think of attempting to raise the silkworms.

All the experiments in silk culture carried on at the Government laboratory have been performed with trees which have been more or less scattered over the city of Manila, but sufficient work has been done to enable us to estimate the quantity of leaves that one may expect from a given area.

Calculated upon a basis of 20 trees for 35,000 worms, a hectare should support conservatively 1,750,000 to 2,000,000 silkworms. Two million silkworms produce about 1,300 kilos of cocoons, 12 per cent of which will be good raw silk, or say 150 kilos. This at a minimum of ₱8 per kilo indicates at the lowest possible figure ₱1,200 as the gross proceeds from a hectare of land.

I am aware that this figure is about the lowest one we need use in the calculation and am sure that with proper management a hectare should yield 30 to 40 per cent more than this.

The silk exhibit at the Carnival of 1910 was intended to show the visitors the whole process of silkworm raising up to and including the reeling of the silk by machinery. One can easily imagine that the most essential thing in silk culture is absolute cleanliness on the part of those engaged in caring for the silkworms. Without this every other effort or precaution would be vain, and no one should undertake the work who is not thoroughly prepared to carry out this programme of cleanliness. Everything connected with buildings, racks, trays, and attendants must be scrupulously clean, otherwise there is a serious likelihood that some form of disease will get into the silkworm colonies and carry them off faster than cholera could carry off human victims.

Experiences of growers in France, Japan, Italy, and other countries have taught us that it is impossible to put too much stress on the question of proper sanitary measures in silk culture.

For the proper care of the silkworms some form of camarine in which there may be afforded protection from sun, wind, rain, ants, mice, etc., must be provided. Such camarine need not be of expensive construction, in fact it need be little more than a shed with sinamay netting for the sides and with suale screens to be used in time of baguios.

The racks must, of course, be protected against ants and mice, which are the greatest enemies of the silkworms.

In order that the silkworms be protected from too strong light, the roof should come down to within 2 meters of the ground.

Those who saw the silk exhibit at the Carnival had a chance to observe the quality of the spun fiber and of the cloths that have been woven therefrom. They can not doubt but that the fiber shown is at least the equal of any that is at the present time imported for the manufacture of jusi and other cloths.

It must not be supposed that every silk plantation must have a piece of machinery such as that run at the Carnival; indeed, the most feasible plan would be to use small hand reels which could be distributed among the houses on the plantation and used to better advantage by the women and girls.

If large silk plantations were started, it would be perhaps better to have a central depot where all cocoons could be brought to be spun by machinery, but the other method would undoubtedly be cheaper, while the results would not be as uniform as to grade of silk and size of strands.

As this article only purports to give an idea of the possibilities of silk culture and not all the details, those who might be

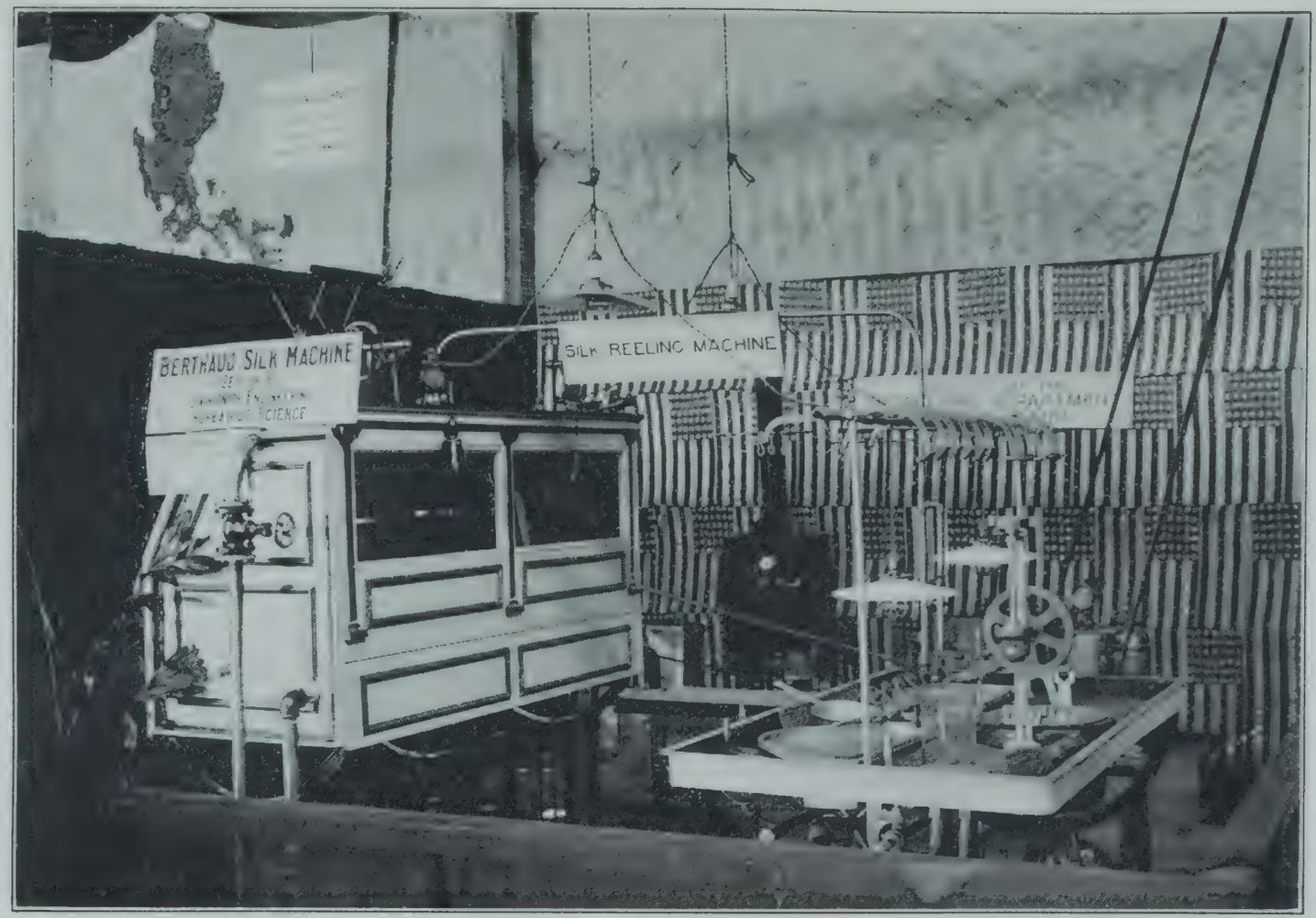

PLATE VII.—THE BARTHAUD SILK MACHINE.

more particularly interested would do well to apply to the Entomologist, Bureau of Science, Manila, for more explicit information.

Twenty-six generations of silkworms have been raised in the Philippines in the past three years, and it is gratifying to be able to state that at no time has there appeared any sign of disease.

The above statements refer to the silkworms fed upon mulberry leaves; but before closing this article it might be well to state that there is another species of silkworm, a kind called "Eri" which feeds upon the leaves of the castor plant (*tañgantañgan*) and which furnishes the silk known variously as "Tussar," "pongee," etc.

This silk, while inferior in some respects to the true mulberry silk, has many advantages in a country like the Philippines where so much of the fiber and cloth used is imported.

Grown in the Tinguian and Ilocano regions this product of the "Eri" silkworm would soon enter into strong competition with raw cotton as a material to be used in the weaving of cloths for clothing, blankets, and other objects in which these people of northern Luzon so excel. It is used extensively in India, China, and other parts of the East. There is no reason why it should not find ready acceptance in these Islands.

The castor plant (*tañgantañgan*) grows in all parts of the Archipelago as a weed. It can be quickly grown from seed, and a plantation of this in connection with a mulberry plantation would mean a source of revenue during the first two or three years before the mulberry trees could be used as food for the true silkworm.

Taken in its entirety, the outlook for silk culture in the Philippines is an exceedingly bright one for those who, as in other pursuits, have the necessary perseverance and who are free from that cantankerous pessimism that sees only disaster ahead of him who makes any kind of venture here.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the Collector of Customs.

JANUARY, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Total.
Rice	Quantity	Kilos	4,518,390	1,378,753	1,227,897	65,516	116,545	3,009		7,310,110
	Value	Dollars	130,370	41,242	38,683	2,401	3,967	117		216,780
Beef cattle	Quantity	Numbers	4,107	98	944	1	14			5,164
	Value	Dollars	60,132	2,209	30,202	31	442			93,116
Hogs	Quantity	Kilos			1					1
	Value	Dollars			1					1
Eggs	Quantity	Kilos	271,451	261	38		937			272,687
	Value	Dollars	26,875	12	2		43			26,932
Sugar	Quantity	Kilos	223,102	8,665	15,064	6,683	11,851	196		265,561
	Value	Dollars	13,842	618	1,082	495	852	22		16,911
Coffee	Quantity	Kilos	155,250	3,299	1,824	884	1,410	12		162,679
	Value	Dollars	36,441	789	400	217	341	4		38,192
Cacao	Quantity	Kilos	93,225							93,225
	Value	Dollars	23,366							23,366
Raw cotton	Quantity	Kilos	1,373							1,373
	Value	Dollars	252							252

EXPORTS.

Hemp	Quantity	Kilos	9,991,158	1,423,920						11,415,078
	Value	Dollars	949,531	157,383						1,106,914
Sugar	Quantity	Kilos	562,400	1,518,000	1,014,444					3,094,844
	Value	Dollars	26,495	141,600	59,250					227,345
Copra	Quantity	Kilos	4,464,174			137,451	249,478			4,851,103
	Value	Dollars	368,618			11,588	21,564			401,770
Tabacco	Quantity	Kilos	1,072,290							1,072,290
	Value	Dollars	187,893							187,893
Cigars	Quantity	Thousand	15,466							15,466
	Value	Dollars	260,531							260,531
Cigarettes	Quantity	Thousand	2,816							2,816
	Value	Dollars	3,525							3,525

ILOILO SUGAR DATA.

By José T. Figueras, *General Broker, Iloilo.*

The arrivals of sugar in Iloilo from the fields and sugar mills during the month of January amounted to 157,995 piculs, most of which were firsts and seconds.

The market opened on the first of the month at 6 pesos 6 reales, at which price it continued until it went up to 6 pesos 6½ reales. On the 5th it was quoted at 7 pesos, but dropped again the same day to 6 pesos and 6½ reales, at which price it continued almost steady until about the 12th, when it went up to 7 pesos and gradually rose each day until the 15th, when it was quoted at 7 pesos and 2 reales. This quotation continued steady until near the end of the month; on January 27, the highest price for the month, namely, 7 pesos and 4 reales, was quoted; this price continued steady until the close of the month with every indication of a still higher quotation in the near future.

January shipments.

CROP 1909–10.

Date.	Vessel.	Destination.	Superior piculs.
January 5	Kaifong	Hongkong	13,853
January 17	Sungkiang	do	1,618
Total for January			15,471

Exports up to January 31 for 1909 and 1910.

[In piculs.]

To—	1908-09.		1909-10.	
	Superior.	Wet.	Superior.	Wet.
United States			18,400	
Japan	8,000	5,915		
China	132,059		29,722	
Total	140,059	5,915	48,122	

THE HEMP AND MAGUEY MARKET.

The following extracts which may interest producers are taken from Smith & Schipper's monthly report, dated New York, January 3, 1910.

MANILA.

Notwithstanding the small amount of business done in December, prices held very steady, and quotations at the close show practically no change except in the case of the very high grades, which have advanced about $\frac{1}{4}$ cent per pound. Good current has been sold at $7\frac{1}{2}$ cents, December to January and January to February shipment. April to May hemp has been sold at a discount from these prices. The market in Manila has held firm, and it has been reported that the dealers are storing their hemp in anticipation of better prices.

The total receipts for 1909 (subject to correction) are 1,273,000 bales, compared with 1,052,000 bales in 1908. The weekly receipts recently have been more moderate, and it seems to be the general opinion that we are likely to have smaller receipts this year than last—at least they are not expected to exceed 1909. There is apparently no surplus this year, and there is no doubt that the world can take care of just as much hemp in 1910.

Although London has ruled quite irregular during the month, the general tone of the market has been steady, and speculators have operated with caution. Even the prices put out by second hands have in only a few instances been under the quotations ruling here.

Quotations.[1]

	March to April.	February to March.	January to February.	December to January.	Afloat U. S.	Spot U. S.
F. E. A. quality	8¾	8¾	8¾	8¾	8¾	8¾
Superior good current	8½	8½	8½	8½	8½	8½
50 per cent over good current	8¼	8¼	8¼	8¼	8⅜	8⅜
Good current	7⅛–7⅜	7⅛–7⅜	7⅛–7⅜	7⅛–7⅜	7¾	7¾
75 per cent over fair current	7¼–7⅜	7¼–7⅜	7¼–7⅜	7¼–7⅜	7⅛	7⅛
Midway hemp	7⅛–7¼	7⅛–7¼	7⅛–7¼	7⅛–7¼	7¼	7¼
25 per cent over fair current	6⅝–6¾	6⅝–6¾	6⅝–6¾	6⅝–6¾	6¾	6¾
Fair current	6⅜	6⅜	6⅜	6⅜	6⅜	6⅜
Superior	6	6	6	6	6	6

[1]These quotations are in cents United States currency per pound.

SISAL.

This market has held steady at 6 cents spot and shipment, but the demand from the Eastern buyers has been very small.

MAGUEY FIBER.

Quiet and unchanged at $4\frac{3}{4}$ cents for No. 1 and $4\frac{1}{2}$ cents for No. 2, December to January or January to February shipment.

Latest cable advices from Manila, January 3, 1910.

	1909.	1908.	1907.
Cleared for United States since January 1	744,000	468,000	402,000
Cleared for United Kingdom since January 1	471,000	502,000	405,000
Receipts at all ports since January 1	1,273,000	1,052,000	967,000

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the Director of the Weather Bureau.

JANUARY, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar.		Rice.		Tobacco.			
	Albay.		Tacloban.		Iloilo.		Tarlac.		Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	26.6	21.1	(a)	7.9	26.9	------	27.0	------	24.6	------	25.6	------
2	25.2	10.2	------	9.4	26.2	------	27.2	------	24.0	14.3	25.8	------
3	26.5	17.7	------	6.6	26.4	0.5	26.1	------	22.8	1.8	25.3	------
4	25.8	49.3	------	8.2	27.3	------	26.8	------	24.3	6.4	25.5	10.8
5	25.8	27.7	------	5.6	26.6	4.6	27.3	------	24.0	------	27.0	------
6	26.2	26.7	------	------	26.7	------	25.8	------	24.9	------	25.8	------
7	26.5	------	------	1.3	25.4	2.3	------	------	23.6	------	25.4	------
8	25.8	30.5	------	10.2	26.0	------	24.1	------	22.8	------	24.0	------
9	26.1	8.9	------	7.3	26.6	------	26.4	------	24.1	------	24.4	------
10	26.9	------	------	12.5	26.2	------	26.4	------	24.5	------	25.5	------
11	25.7	22.6	------	3.6	26.7	------	26.2	------	24.6	------	24.5	------
12	26.5	------	------	0.5	26.5	1.5	25.4	------	25.5	------	25.4	------
13	26.4	------	------	------	25.9	------	25.4	------	24.6	------	24.5	------
14	25.7	------	------	14.0	25.8	------	24.8	------	23.6	1.3	25.0	------
15	26.4	13.2	------	2.0	25.5	------	25.2	------	22.7	------	25.0	------
16	24.9	4.9	------	18.3	26.0	------	25.2	------	22.2	------	25.1	------
17	25.5	1.6	------	3.8	25.7	------	24.4	------	23.5	------	24.2	------
18	24.6	14.0	------	7.4	25.5	0.8	24.0	------	21.6	8.6	23.4	------
19	23.9	161.4	------	61.9	25.4	3.1	24.8	------	22.2	------	24.0	------
20	23.7	97.7	------	13.3	25.8	0.8	25.2	------	22.7	------	25.4	0.8
21	24.2	18.1	------	10.9	26.6	------	26.6	------	24.9	------	25.6	23.1
22	26.1	0.3	------	4.3	25.8	------	26.6	------	22.9	29.7	25.6	------
23	26.3	7.1	------	------	26.0	------	26.6	------	23.8	9.9	25.8	------
24	25.7	3.3	------	6.8	26.0	------	26.6	0.8	22.9	5.1	26.2	------
25	25.6	6.9	------	22.9	26.0	------	------	------	22.0	21.4	24.4	------
26	24.0	12.2	------	5.1	25.5	------	24.0	------	19.9	8.7	22.8	------
27	24.6	2.3	------	46.0	24.3	7.6	24.8	------	20.9	------	23.2	------
28	25.2	3.9	------	14.3	24.6	------	23.8	------	21.8	------	23.2	------
29	25.3	------	------	5.6	25.2	------	24.6	------	22.8	------	23.0	------
30	24.0	9.4	------	0.8	24.8	0.8	24.4	------	22.6	1.3	23.6	------
31	24.3	65.4	------	29.1	25.6	3.0	25.3	------	21.6	1.3	23.5	------

[a] The thermometers of this station were broken during the typhoon of November 6, 1909.

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING SEPTEMBER 30, 1909.

Act 1898 requiring municipal presidents to give quarterly statistics of agriculture and live stock, referred to in Exhibit D of the January number of the REVIEW, went into effect July 1 last. This was new work for most of the presidents, so that considerable correspondence was necessary before their reports could be accepted. The tables of crops and range of prices in this number, it will be seen, are based on reports for the first quarter under the new law.

Municipal presidents are largely dependent upon the municipal councilmen for their information, the latter having shown a commendable interest in their new work, which largely consists of inducing the individual planters to keep them so promptly and fully posted that their reports can be turned in immediately after the end of each quarter to the president, as a basis for his report. It is now assured that in future the REVIEW will be able to publish tables with less delay than in the present case.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Agusan (report from 1 municipality):		*Hectares.*	*Hectares.*		
Rice	Good	150			
Abacá	do	10			
Coconuts (copra)	do				
Sugar cane					
Tobacco					
Corn	Good	50			
Albay (reports from 9 municipalities):					
Rice	do	2,835	15	27,000	Liters.
Abacá	do	268	6,490	1,516,735	Kilos.
Coconuts (copra)	do			286,270	Do.
Sugar cane	do	3			
Tobacco					
Corn	Fair	17	145	55,500	Liters.
Ambos Camarines (reports from 23 municipalities):					
Rice	do	9,107	101	149,325	Do.
Abacá	do	329	4,000	3,992,277	Kilos.
Coconuts (copra)	Good			245,600	Do.
Sugar cane	do	61	61	6,515	Do.
Tobacco					
Corn	Fair	62	132	39,750	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Antique (reports from 11 municipalities):		*Hectares.*	*Hectares.*		
Rice	Good	12,105	490	422,250	Liters.
Abacá	do	17	73	26,122	Kilos.
Coconuts (copra)	do			49,651	Do.
Sugar cane					
Tobacco					
Corn	Fair		425	478,950	Liters.
Bataan (reports from 9 municipalities):					
Rice	do	2,878			
Abacá					
Coconuts (copra)					
Sugar cane					
Tobacco					
Corn	Poor	3	1,395	305,925	Do.
Batangas (reports from 16 municipalities):					
Rice	do	1,856	18,096	10,874,925	Do.
Abacá	Fair	1	66	8,981	Kilos.
Coconuts (copra)	do			1,581	Do.
Sugar cane	do				
Tobacco					
Corn			3,063	886,275	Liters.
Bohol (reports from 21 municipalities):					
Rice	Fair	2,530	31	45,375	Do.
Abacá	Good	66	482	151,041	Kilos.
Coconuts (copra)	do			640,243	Do.
Sugar cane	Fair	11	18	30,486	Do.
Tobacco	Good	100	14	26,082	Do.
Corn	Fair	1,094	3,787	2,737,950	Liters.
Bulacan (reports from 10 municipalities):					
Rice	do	16,159	18	13,500	Do.
Abacá					
Coconuts (copra)					
Sugar cane	Fair	400	140	70,840	Kilos.
Tobacco					
Corn	Fair	5	476	290,250	Liters.
Cagayan (reports from 11 municipalities):					
Rice	do	1,343	2,410	3,436,500	Do.
Abacá					
Coconuts (copra)	Fair				
Sugar cane	do	40	2	1,897	Kilos.
Tobacco					
Corn	Fair	783	3,368	2,937,750	Liters.
Capiz (reports from 23 municipalities):					
Rice	do	22,638	6,671	4,279,500	Do.
Abacá	do	588	748	164,450	Kilos.
Coconuts (copra)	do			300,437	Do.
Sugar cane	do	8	5	3,795	Do.
Tobacco	do	5	7	10,442	Do.
Corn	do	38	706	474,675	Liters.
Cavite (reports from 7 municipalities):					
Rice	do	9,635	952	262,500	Do.
Abacá	do	6	75	18,975	Kilos.
Coconuts (copra)	do			2,214	Do.
Sugar cane	do	62			
Tobacco					
Corn	Poor	2	126	168,975	Liters.
Cebu (reports from 28 municipalities):					
Rice	Fair	305	1,240	1,512,750	Do.
Abacá	Good	65	905	2,792,171	Kilos.
Coconuts (copra)	do			407,140	Do.
Sugar cane	do	25	25	6,325	Do.
Tobacco	Fair		407	311,696	Do.
Corn	do	5,690	28,552	50,523,450	Liters.
Ilocos Norte (reports from 9 municipalities):					
Rice	do	13,492			
Abacá					
Coconuts (copra)	Good				
Sugar cane	do	199			
Tobacco	Fair		50	39,100	Kilos.
Corn	do	39	520	789,750	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Ilocos Sur (reports from 29 municipalities):		*Hectares.*	*Hectares.*		
Rice	Fair	20,889	4	6,750	Liters.
Abacá					
Coconuts (copra)	Fair			3,605	Kilos.
Sugar cane	Good	2			
Tobacco			10	11,040	Do.
Corn	Fair	141	2,303	4,150,800	Liters.
Iloilo (reports from 14 municipalities):					
Rice	do	18,387	997	705,000	Do.
Abacá	Good	5	15	6,451	Kilos.
Coconuts (copra)	do			23,339	Do.
Sugar cane	do	15			
Tobacco	Fair		146	207,460	Do.
Corn	do	38	3,896	1,637,175	Liters.
Isabela (reports from 2 municipalities):					
Rice	do	30			
Abacá					
Coconuts (copra)					
Sugar cane					
Tobacco					
Corn	Fair		294	442,050	Do.
La Laguna (reports from 8 municipalities):					
Rice	do	6,905	400	600,000	Do.
Abacá	Good	21	206	121,693	Kilos.
Coconuts (copra)	do			210,559	Do.
Sugar cane	Fair	44			
Tobacco					
Corn	Good	30	30	33,750	Liters.
La Unión (reports from 11 municipalities):					
Rice	Fair	17,401	10	6,000	Do.
Abacá					
Coconuts (copra)	Good			35,926	Kilos.
Sugar cane	Fair	42			
Tobacco	do		2	368	Do.
Corn	Good	52	918	543,000	Liters.
Leyte (reports from 16 municipalities):					
Rice	do	6,844	1,359	1,251,375	Do.
Abacá	do	1,127	7,358	3,317,273	Kilos.
Coconuts (copra)	do			348,002	Do.
Sugar cane	do	108	80	61,605	Do.
Tobacco	Fair	602	1,255	218,960	Do.
Corn	do	2,516	1,915	1,433,100	Liters.
Mindoro (reports from 3 municipalities):					
Rice	Good	240	136	256,500	Do.
Abacá			130	32,700	Kilos.
Coconuts (copra)	Good				
Sugar cane			1	253	Do.
Tobacco					
Corn			23	28,125	Liters.
Misamis (reports from 3 municipalities):					
Rice					
Abacá	Fair	95	624	188,548	Kilos.
Coconuts (copra)	do			142,046	Do.
Sugar cane	Good	4	5	12,350	Do.
Tobacco					
Corn	Fair	65	370	885,000	Liters.
Moro (reports from 6 municipalities):					
Rice	Good	1,502	371	748,650	Do.
Abacá	do	17	488	389,620	Kilos.
Coconuts (copra)	do			270,836	Do.
Sugar cane	do	12	22	14,105	Do.
Tobacco			3	1,794	Do.
Corn	Good	120	327	402,750	Liters.
Mountain (reports from 15 municipalities):					
Rice	Fair	3,671	279	426,300	Do.
Abacá					
Caconuts (copra)					
Sugar cane					
Tobacco					
Corn	Fair	2	144	77,775	Do.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Nueva Ecija (reports from 17 municipalities):		*Hectares.*	*Hectares.*		
Rice	Fair	51,843	50	75,000	Liters.
Abacá					
Coconuts (copra)	Good				
Sugar cane	do	11			
Tobacco					
Corn			1,072	1,149,600	Do.
Nueva Vizcaya (reports from 2 municipalities):					
Rice	Good	572			
Abacá					
Coconuts (copra)	Good				
Sugar cane					
Tobacco					
Corn		2	1	750	Do.
Occidental Negros (reports from 12 municipalities):					
Rice	Fair	8,487	120	90,000	Do.
Abacá	do	207	96	8,159	Kilos.
Coconuts (copra)	do			92,255	Do.
Sugar cane	do	870	518	844,957	Do.
Tobacco					
Corn	Good	275	1,118	1,005,375	Liters.
Oriental Negros (reports from 9 municipalities):					
Rice	do	780	675	1,002,000	Do.
Abacá	do	4,222	2,186	2,571,808	Kilos.
Coconuts (copra)	do			274,315	Do.
Sugar cane					
Tobacco	Fair	40	45	37,260	Do.
Corn	do	2,472	2,944	7,960,950	Liters.
Palawan (report from 1 municipality):					
Rice	do	55	159	155,025	Do.
Abacá					
Coconuts (copra)	Good			3,795	Kilos.
Sugar cane					
Tobacco					
Corn			13	7,125	Liters.
Pampanga (reports from 17 municipalities):					
Rice	Poor	31,138	10	6,000	Do.
Abacá					
Coconuts (copra)	Good				
Sugar cane	Fair	2,900			
Tobacco					
Corn	Fair	87	423	237,675	Do.
Pangasinan (reports from 37 municipalities):					
Rice	do	91,191	24	28,500	Do.
Abacá					
Coconuts (copra)	Good			104,615	Kilos.
Sugar cane	do	150	2	632	Do.
Tobacco	do	100	101	92,460	Do.
Corn	Fair	188	1,481	836,700	Liters.
Rizal (reports from 17 municipalities):					
Rice	do	5,736			
Abacá					
Coconuts (copra)	Good				
Sugar cane	Fair	2	1	949	Kilos.
Tobacco					
Corn	Poor	219	347	74,025	Liters.
Samar (reports from 16 municipalities):					
Rice	Good	659	1,034	1,818,225	Do.
Abacá	do	393	1,284	336,680	Kilos.
Coconuts (copra)	Fair			348,128	Do.
Sugar cane	do	86	70	99,555	Do.
Tobacco	do	4	77	33,626	Do.
Corn	Good	88	253	146,700	Liters.
Sorsogon (reports from 13 municipalities):					
Rice	Fair	243	1	2,250	Do.
Abacá	Good	556	6,786	870,700	Kilos.
Coconuts (copra)	do			67,994	Do.
Sugar cane	do	17	32	23,276	Do.
Tobacco	do		26	11,049	Do.
Corn	Fair	283	666	442,650	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Surigao (reports from 2 municipalities):		*Hectares.*	*Hectares.*		
Rice					
Abacá	Good	82	399	254,265	Kilos.
Coconuts (copra)	do			70,334	Do.
Sugar cane					
Tobacco	Good	10	20	4,140	Do.
Corn	Fair	150	70	5,250	Liters.
Tarlac (reports from 11 municipalities):					
Rice	do	18,137			
Abacá					
Coconuts (copra)	Fair				
Sugar cane	do	10			
Tobacco					
Corn	Fair	5	192	64,275	Do.
Tayabas (reports from 14 municipalities):					
Rice	Good	5,839	1,712	552,000	Do.
Abacá	do	1,355	3,679	1,190,744	Kilos.
Coconuts (copra)	do			1,521,668	Do.
Sugar cane	do	371	34	6,831	Do.
Tobacco	Fair	11	31	5,106	Do.
Corn	do	132	435	144,000	Liters.
Zambales (reports from 8 municipalities):					
Rice	do	13,160			
Abacá					
Coconuts (copra)	Good				
Sugar cane	do	2			
Tobacco					
Corn	Good		26	14,550	Do.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abaca, copra, sugar, tobacco, and corn for the quarter ending September 30, 1909.

[NOTE.—75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal.]

Province.	Unhulled rice per 75 liters.		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱3.00	₱3.00	₱7.90	₱6.30	₱8.20	₱8.20					₱2.50	₱2.00
Albay	3.50	2.00	11.05	5.72	12.00	5.00	₱6.00	₱5.00			5.00	1.00
Ambos Camarines	4.50	2.50	12.25	5.00	9.50	4.75	8.00	2.20			4.00	1.60
Antique	3.12	1.50	18.00	10.00	7.70	5.00	5.00	3.00	₱25.00	₱12.00	2.50	1.00
Bataan	3.00	1.75					9.00	5.00			5.00	1.50
Batangas	4.00	2.25	12.00	5.00	7.00	5.00	9.00	3.00	11.00	6.00	4.00	1.80
Bohol	4.00	2.00	15.00	4.00	9.50	5.00	7.20	3.00	30.00	8.00	5.00	2.00
Bulacan	3.00	2.20					8.50	5.00	20.00	10.00	3.50	1.25
Cagayan	5.00	2.25			4.00	4.00	7.00	7.00	17.00	7.00	4.50	1.25
Capiz	3.80	1.50	15.00	6.00	10.00	5.00	6.00	3.00	25.00	4.00	5.00	1.00
Cavite	4.00	2.50	12.00	10.00	5.50	5.50	6.00	3.00	16.00	16.00	3.00	1.75
Cebu	4.50	2.25	16.00	8.00	11.50	6.00	8.00	3.00	30.00	4.50	5.00	2.00
Ilocos Norte	3.75	2.00			6.00	5.00	6.00	4.00	20.00	4.00	3.50	1.00
Ilocos Sur	3.75	2.00			10.00	10.00	7.00	2.50	25.00	5.00	4.00	1.50
Iloilo	3.60	1.50	18.50	14.00	9.30	6.00	8.00	5.00	20.00	5.50	4.50	2.25
Isabela	3.00	3.00							21.00	15.00	4.00	4.00
La Laguna	3.20	2.40	12.50	6.00	8.00	5.00	6.50	4.00	18.00	18.00	5.00	1.50
La Union	3.75	2.20			7.00	4.00	5.00	2.50	10.00	4.85	4.75	2.00
Leyte	3.75	1.50	12.50	8.75	8.50	4.00	8.00	4.00	30.00	10.00	3.50	1.50
Mindoro	5.00	2.50	12.00	10.00	5.00	5.00	5.00	5.00	7.50	5.00	4.00	2.50
Misamis	3.75	2.50	9.00	6.95	9.50	7.60	4.00	4.00			5.00	2.50
Moro	4.00	1.50	14.00	6.60	9.00	7.00	7.50	4.12	25.25	25.25	2.50	2.00
Mountain	8.00	3.00			10.00	5.00	6.00	3.50	30.00	4.00	6.50	2.50
Nueva Ecija	3.75	1.25			7.00	7.00	8.00	4.00	30.00	5.00	3.75	1.00
Nueva Vizcaya	3.00	2.45							20.00	17.00	3.50	1.50
Negros Occidental	3.50	2.75	12.00	7.00	10.50	6.00	7.62	4.00	23.00	6.50	3.50	1.50
Negros Oriental	4.00	2.25	15.00	6.00	9.80	6.50	6.00	4.50	25.00	4.75	5.00	2.50
Palawan	3.50	2.50	12.00	11.00	6.00	5.00			25.00	20.00	2.00	1.50
Pampanga	2.50	2.00					8.00	4.00			2.50	1.25
Pangasinan	4.50	1.50			8.00	4.50	8.25	4.00	32.00	4.50	5.00	1.25
Rizal	3.50	2.00	18.00	18.00			8.00	3.00			4.00	2.00
Samar	4.00	2.00	13.00	6.00	8.00	5.00	8.00	4.00	20.00	5.00	4.00	2.00
Sorsogon	3.50	2.50	16.50	7.50	8.50	4.50	8.25	3.50	30.00	5.00	3.00	2.00
Surigao	3.00	1.75	11.50	9.00	8.75	7.00			30.00	20.00	2.00	1.50
Tarlac	3.00	2.00					8.00	4.00	20.00	9.00	3.00	1.25
Tayabas	3.25	2.50	18.00	6.00	7.00	4.50	7.00	4.00	25.00	6.00	3.00	2.00
Zambales	2.50	1.75			5.00	5.00	5.00	4.00	12.50	12.00	5.00	1.50

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ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
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REPORTS AND QUOTATIONS.

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Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
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Boletim do Museu Goeldi, Para, Brazil.
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THE PHILIPPINE

Agricultural Review

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EDITORIAL.

MR. ARTHUR F. BYARS, AGRICULTURAL INSPECTOR.

Mr. Byars's untimely death from typhoid fever, which was unexpected by nearly everyone except his attending physicians, took place at the Civil Hospital Thursday evening, March 17, 1910.

Arthur F. Byars was born September 19, 1885, in Cherokee County, South Carolina. He was educated in the graded schools of Marion, South Carolina, where he was graduated and received a diploma. After his graduation he returned to the Marion schools and did one year of graduate work. In September, 1903, he entered Clemson Agricultural College as a sophomore, where he began the work of his chosen profession. During his college course Mr. Byars specialized in dairying and animal husbandry, and on June 12, 1906, was granted the degree of bachelor of science. On April 19, previous to his graduation, he took the United States civil-service examination for scientific assistant at Greenville, South Carolina. On this occasion Prof. J. N. Harper, of Clemson Agricultural College, stated that he ranked high as a student of agriculture and was very thorough in his studies and his work. Prof. John Michels, of the same institution, spoke of him as a very conscientious and industrious student. Mr. Byars was passed and placed on the United States civil-service register July 27, 1906. He was appointed an assistant agricultural inspector in this Bureau February 9, 1908, promoted to agricultural inspector on October 1, 1908, and again promoted on October 1, 1909.

His entire service in this Bureau was marked by a high degree of efficiency and a most praiseworthy interest and enthusiasm in his work. The Bureau of Agriculture by the death of Mr. Byars loses one of its most efficient and trusted employees, and his fellow-workers and associates a friend whose memory will be cherished and whose loss will be deeply mourned.

THE REVIVAL OF INTEREST IN AGRICULTURE.

From different parts of the Islands word is reaching Manila that there is a decided revival of interest in agriculture manifested by the people in the country. For years many of the large landowners who were engaged in farming in Spanish times have been practically idle. Now many of them see in present conditions the promise of renewed prosperity. Some

are buying new machinery, many are buying work animals and looking for help to cultivate their lands that they may share in the large profits which present prices promise to sugar producers, tobacco raisers, and coconut and hemp growers, to say nothing of the possibilities for growing rubber, coffee, cassava, and other crops.

From the Cagayan Valley we hear enthusiastic reports regarding the tobacco crop for next year of large areas of land adapted to growing tobacco, which offer a rich reward to those prepared to take up this line of farming. Enthusiasm over the prospects for tobacco farming is not confined to the Cagayan Valley alone, but a great deal of interest has been manifested in the tobacco-growing business in Ilocos Norte, Union, Capiz, Iloilo, Occidental Negros, and several other provinces.

From the sugar sections of Negros, Iloilo, Antique, and Capiz, reports indicate that there will be a decided increase in the amount of land planted to sugar cane this year. Bulacan, Pampanga, and several other provinces are preparing to share largely in the profits in consequence of the high price of sugar. Several new sugar plantations have been established. More than this, we have an object lesson in the investment of millions of pesos by two large sugar-producing companies, demonstrating the faith of sugar experts in the possibilities of other sections of the Philippines than those to which we have been accustomed to look as centers of the sugar industry. These two companies, we believe, will establish model sugar plantations with up-to-date equipment and machinery equal to that found anywhere in the world, so that those who desire may see and learn for themselves of the possibilities when this industry is carried on in accordance with the most modern methods.

From Ambos Camarines, Misamis, and other sections comes word that many of the people are turning their attention to the cultivation of land which has for years been lying idle, and planting rice, corn, camotes, coconuts, and other crops. In Bataan, Cebu, and other provinces, farmers' associations are being formed to protect the interests of agriculturists. In Manila the three buildings of the College of Veterinary Science have been finished, and in Bacolod an agricultural school building which cost ₱10,000 has been completed.

While these signs indicating confidence in the future peace and prosperity of the country are coming from nearly every section, we have from those responsible for the Government such guaranties to investors as a reform in the land system, which will give to owners of land titles to their holdings in the easiest

possible manner and with the least expense consistent with security to the Government and the interests of the people as a whole. The Government is granting tobacco bounties to a larger number of provinces, encouraging the growing of more and better quality of tobacco. The sale of Government lands in sections of the country that are now practically idle to companies which have sufficient capital to demonstrate the agricultural possibilities of these sections will be of inestimable value in demonstrating the extent of the resources of the Philippine Islands, not only to their own people, but in showing to other countries the importance of Philippine resources and the place these Islands should take in supplying products for the world's trade and commerce. With the facilities for transportation between our commercial centers and the centers of production keeping pace with the facilities for transportation between these Islands, east and west, to America and Europe, which are the two great world centers for commerce; with Manila being made a port which actually attracts ocean travel and therefore the great steamship companies of Europe, America, and Asia, it would seem that the days of prosperity for the Philippines are not far distant.

EXTRACTS FROM THE ADDRESS OF THE GOVERNOR-GENERAL AT ZAMBOANGA.[1]

I am sorry that none of the distinguished Filipinos who have come here to greet me to-day have presented any suggestions or arguments touching any of the real points at issue in this province; that they have not shown me how I can assist them in bettering their condition by increasing the prosperity of the province. The real problem before the Philippine people is not their political status; that is fixed both here and in other parts. The real problem is the industrial development, and by industrial I mean agriculture, manufactures, and commerce. What we want to do is to increase the products of the Islands, and my advice to this distinguished gentleman who has been talking to us, and to his friends and other people who have been thinking about political changes, is to get busy and devote their attention to the practical questions confronting us—things for which there is something to be done. I have come here to do what I can to help the people to better their condition, to increase the products of rubber, hemp, coconuts, sugar, tobacco, lumber, and other things by which money can be made. I want to have, when I come again, Filipinos crowd round me and present suggestions of ways to enable the people to live better, have better houses, better food, and better clothes. No change in the civil status of the government will do that. The government is good enough now; it is all right. To those of you who doubt whether it is a civil government or not, I wish to state that the present government of the Moro Province is purely civil; that General Pershing, although he holds military rank, is a purely civil official in so far as he is governor of the province. He reports to the civilians in Manila and to the Civil Commission and not to the Commanding General in Manila. I am also happy to inform you that I have found that General Pershing and I are in complete accord; that our views are the

[1] Address before residents of the Moro Province at Zamboanga, March 9, 1910, as reported by the Mindanao Herald of March 12, 1910.

same; that we have agreed upon the policy which we will pursue, and anything he says may be taken as being an exact expression of my ideas.

I liken the improvement of Manila and the means of communication coming in and out of Manila to making sure that the heart is all right. Manila is the heart of the whole Archipelago. I am speaking now commercially. Getting the valves and veins and everything working right in the heart will stimulate the movement of that part, which will throw the blood strongly, making it reach every part of the body, to the benefit of the whole. For that reason I think we can not devote ourselves too carefully—and I have devoted my attention to this for the last five years—to making sure that we can handle goods in Manila cheaper than in other places. I want it to compete favorably with the ports of Hongkong, Singapore, and the other ports of transshipment. We have no harbor dues; we have very low wharf dues and that sort of thing. The figures which were presented to me by the Collector of Customs for the amounts to be charged for the use of wharves I cut in half, although he said he could not cover operating expenses. I told him that we have got to have the port running at a low cost to shippers. I want them to know that the cost here is less than elsewhere. He pointed out that the figure he suggested was about one-half that of other places and one-fourth that of New York. Nevertheless, we cut his figures in two. We want to make the Philippines a place where the captains will all say, "Take me to Manila." Heretofore, when I came out here, and I believe the practice still exists in some ports, officers of the steamships would try to avoid coming to the Philippines.

We have recently appointed a committee in the Commission to care for the affairs of the Moro Province. The chairman of that committee is the one American Commissioner without a portfolio. He has more time than any of the others, and I have suggested to him that he take the place of the man who is going to follow up the interests of the Moro Province in each bit of legislation that comes up; that he be the representative of the Moro Province in Manila. He is the Hon. Frank A. Branagan, formerly Treasurer of the Islands. Another member of that committee is Justice Elliott, who has taken my position as Secretary of Commerce and Police, and the third is the Hon. Rafael Palma, one of the Filipino members of the Commission.

THE NEED OF FARMERS' ASSOCIATIONS AND WHAT THEY SHOULD DO FOR THE DEVELOPMENT OF AGRICULTURE.[1]

By Hon. Rafael Palma.

It is a singular privilege for me, and one of which I am proud, to speak before a congregation of men engaged in such an old and honorable profession—before the farmers of this country, upon whom rests its future welfare. Farmers constitute everywhere the powerful propelling force behind national wealth; and in our country, essentially agricultural, they represent, as in the human skeleton, the backbone which sustains and binds the human structure. You, as farmers, have the most honorable occupation of any men in the world. Your efforts and struggles are not only to feed your own countrymen, but to send to other parts of the world the products which are needed there. Your life has perhaps less excitement and novelty than others, but it is more useful and profitable for mankind.

Our country has so far depended almost entirely upon agriculture. So when agriculture undergoes some of the adversities which occur so often in tropical countries on account of the uncertainties of the weather, all the country suffers, so that it is like a man mortally wounded, from whose veins the life blood is streaming. Even the public revenues suffer a visible depression. In better years, when the crops are abundant, everyone breathes easily once more. We depend absolutely upon agriculture. This is the reason why I think that any time and attention given to the study of questions related to agriculture are most profitable for the community at large.

Since the Payne Bill has inaugurated in our country a new era, which I should call one of economic revolution, agricultural problems have attained a double importance. However, I shall not consider these problems now; I shall limit myself

[1] Address delivered by Hon. Rafael Palma at the Agricultural Conferences held during the Carnival, February 7, 1910.

to stating my opinion regarding the important duty to be performed by our farmers, and the responsibilities to be accepted by them in view of our new situation.

Our agriculture has experienced many adversities during these last few years. Rinderpest, drought, locusts, frequent baguios and inundations, all these evils, together and separately, have contributed to make a situation very different from the one we should desire. But, in looking into the causes of the unsatisfactory condition of our fields, we ought not to blame Providence or the Government only, as so many are inclined to do, but we must also ask ourselves whether we have done everything in our power to relieve our own situation and find a remedy for our present afflictions. Those who believe that the Government or Divine Providence will do everything deceive themselves. They must attain salvation by means of their own efforts, and above all in combined efforts.

The easy and comfortable life of the old times is no longer possible. Our standard of living through contact with American civilization has been quickly raised, and it is our duty to rise to the height of the present opportunity. If we remained stationary it would mean our annihilation, while if we make a strong effort to introduce modern habits by adopting the methods of the most advanced countries it will not only result in agricultural progress, but secure for us an economic future vastly superior to the present condition.

Agricultural instruction in the old days followed old and routinary methods. Our farmers used to be satisfied with the results of their individual efforts, and did not take into consideration the advantages to be obtained by coöperation for the purposes of common benefit. The few requirements of our old style of living were met with little effort, and the small value set upon the comforts and pleasures of life made people indifferent about obtaining them. With few exceptions our farms have been cultivated with implements which save neither time nor the cost of production. The harvesting of many of our staple crops has been almost always accompanied by considerable losses in quantity and in quality. This, to a certain extent, was because each farmer relied upon his own capital and help; and, though we have to acknowledge that there were individual successes, when we behold the general picture we have to admit that in spite of the abundant and beneficent natural conditions in which we happened to be born and live, our agriculture is far behind that of other neighboring countries.

Our farmers can not and ought not to remain any longer in individual isolation if they aim at greater material advantages for themselves and for their country. The great centers of light in the West are turned toward the East, and we must shake off the lethargy which has dominated us for centuries in order to face this light squarely.

We must not be ashamed because of our present material backwardness, for which only a little part of the blame falls upon us, but we must, at once, look for a remedy with understanding, foresight, and energy, in order to develop and rapidly increase our material wealth as a firm and solid foundation for our growing national power.

The formation of organizations amongst farmers is most necessary to promote the development and rapid improvement of our agriculture. They must unite their efforts and be allied in everything connected with common necessity or aspiration. In the division of labor which distinguishes complex modern life each group of men with the same necessities and aspirations must be organized for their own protection, help, and defense.

Individual effort can obtain some small successes, but the great ones are reserved to the organizations. It will not be possible to root out the inveterate vices and faults of our system of agriculture without the combined effort and organization of farmers. The extensive lands of our country which are uncultivated, and those so poorly cultivated that the crops are practically confided to the hazards of the weather and to the natural fertility of the ground, without the help of the improved processes of modern agricultural science, offer the most dismal proof of the shortage of means and individual efforts for the general and thorough development of the agricultural resources of our country.

I am glad to point to the fact that, in many ways flattering to native pride, steps have been taken in Manila and in the provinces for the formation of organizations among agriculturists. The Agricultural Association for Negros and Panay, the Pampanga Sugar Association, and associations to be found in other provinces foretell the first signs of our awakening to economic modern life, promising in the near future a strong reaction toward the source of our wealth and days of fuller prosperity and greatness to our country. Each province, each region, in which the same products prevail, must organize its association. Central and local associations must be organized in order to obtain more advantageously the common benefit. It

will be most important to constitute these associations on practical and solid foundations, and to choose farmers who are able, intelligent, and faithful to their duties to manage them and carry out their true purposes.

These organizations will be very useful in promoting sympathy, love, and united strength among those who devote themselves to the same kind of work or trade. The encouragement of such feelings will necessarily result in the generous moving of the heart which makes everyone ready or inclined to extend a hand to the friend or brother in time of trial or failure which may occur. By means of these organizations information on the selling price, the condition of markets, the invention of new machines, etc., can reach a greater number of men, so that each one can make his calculations according to his particular advantage. The exchange of ideas and experience, which is impossible when each one shelters himself behind his individual interest, will be stronger, so that one will profit by the help of another, and through it the general interests will experience a vigorous impulse toward growth and progress.

It is not well that man should be shut up in an unreasonable selfishness to pay attention to his particular gain only; he must show the same interest for his country's wealth as for his own. Man ought not to forget that he is a citizen of his country, and civil duty requires him to extend to his neighbors the benefit of his discoveries and experience.

In the first place, these organizations must try to profit by the processes indicated by science in order to maintain and improve the fertility of the soil and make use of modern implements for the plowing of the ground and improvement of cultivation. The reduction of time and space, as well as of the cost of production, by introducing machinery and mechanical appliances have been proved in other countries. We are fortunate to be able to take advantage of the results of such experience, acquired by such countries in the course of years and centuries. The use of scientific processes and of agricultural machinery on the lands which need them will not only place a more abundant production in the hands of the farmer, but also a greater return for the capital invested. The rule of obtaining the greatest production with the greatest possible economy is well established, and must be observed and practiced by the Filipino farmer.

In the second place, these organizations will also do much good if they try to extend the planting of certain products not well exploited yet, to extend and better the quality of those

already known, which may be more remunerative under more favorable circumstances, and to introduce and encourage the cultivation of several crops in one field. The Bureau of Agriculture with its acquired experience is always ready to furnish the best information concerning crops little or not at all exploited, the cultivation of which is recommendable in this country on account of the advantageous prices they meet in foreign markets. The farmer must not be satisfied with one kind of crop, and it is necessary to recommend to him a diversity of crops, in accordance with the conditions of the ground, in order to face the setbacks which each product has to undergo necessarily and periodically. The sudden fall in price of a special product can cause impoverishment or ruin, as has recently happened to some abacá planters. It will be prudent to recommend to him also the cultivation of the necessary products which are to be consumed at home and by the farmers and other laborers, as it constitutes an excellent help for his own plantation. But the benefical action of these organizations can be specially demonstrated in the help they can give to the association in order to extend and better their respective crops. For not every farmer has at his disposal the required capital to buy the necessary machinery to plow his land or better his crops, while the organization of several farmers can raise the funds necessary for the purchase, and the association through a lease or other contract will be able to give to the members for some time and at stated times the use of such machinery.

There is a continual and widespread complaint against the kind of stock-jobbing and exploitation to which our farmers are subjected by the merchants and their agents. Organizations among farmers can, to a great extent, root out this pernicious practice by means of intelligent coöperation among the members, preventing the bad but common mistake of borrowing money on their future harvests, and by adopting such measures as will permit them or their agents to place the products on the market or where the price is higher. It is not wise to exclaim continually against the abuses of usury and exploitation, when by our indifferent behavior we are really accomplices and docile instruments of these abuses. An agriculturist of a province near Manila told me the other day that there was a difference of ₱2 per picul in the price of sugar between Manila and his town. The freight per picul was, as he told me, ₱0.50 only. And though this fact was very well known to him he preferred losing ₱1.50 per picul selling it in his town instead

of bringing it to Manila. It is certainly surprising that sometimes, knowing of such misusages, we do not put an end to them by means which are at hand, instead of passing them by with indifference.

There is much to be done in the way of stimulating and improving the condition of laboring men. It will be a relief to see these organizations concerning themselves with the needs and education of that numerous group of workmen who by their hard labor and struggles contribute to production. It will be necessary to inculcate in them, by means of these organizations, the idea of seriousness and exactness in the performance of their duties and obligations, and to develop in them, with better salaries, the desire for a better style of living than that to which they have been accustomed. It would be proper and advantageous for these organizations to allot rewards and compensations to the good workman who has cultivated or planted more land during a certain period of time, to the laborer who more zealously attends to the education of his children, to the workman who has saved more during a certain period of time, to the laborer who has improved his dwelling with his own savings, to the laborer who has abandoned the bad customs and practices of his past life. Everything done toward lifting up the workingman's condition, toward furnishing him assistance and stimulus for his improvement, will result in benefit to our agriculture, as the work will be more intelligent, active, and exact, and with this the results of agricultural work will be far more satisfactory than at present.

It is a growing custom in developing a country's agriculture to organize fairs with rewards for the agriculturists who have demonstrated ability and merit deserving reward and compensation. This task is one of the most worthy for which the agriculturists' associations might be employed. Nothing will so much incite individual initiative, nothing will more exactly show the progress attained in the various cultivations, nothing will better persuade our agriculturists to improve their methods of planting and cultivation than this kind of exhibitions. The ambition for renown and fame has always constituted a powerful incitement to the human heart for the improvement and perfection of work. These shows should be periodical in order to obtain better results. It seems to me it would not be difficult to obtain economical coöperation from the Government for this kind of enterprise, if the shows were organized with seriousness and with probabilities of success.

It would be foolish for me to attempt to indicate more minutely

what these organizations should do in order to promote the development of agriculture in such an incipient stage as ours. I have indicated some general lines somewhat vaguely, firmly believing that you, with more competency, knowledge, and experience in the subject, can better than I explore the way in which you must direct your steps. I consider myself scarcely competent to predicate and advise you on subjects upon which I have little knowledge, but let me repeat to you for the last time that it is necessary for you to organize yourselves, because the improvement of agriculture means strength for the nation and security of the country's interests. There is no reason why we should not follow the example of other countries in which agriculture is rich and flourishing in spite of the lack of a soil so rich and fertile as that of the Philippines. Energy and virility, qualities which we suppose to exist in our race, can not have better demonstration than in the economical contest opened to the whole world's initiative and capital. In this fight we have to perish or save ourselves. We must fear little of what others can do against us while we live ready for the sacred defense of our own interests, working hard to obtain and keep them. Let us remedy our weakness and backwardness with a powerful demonstration of energy and courage in all the fields of our activity. We must not expect prosperity from any source other than ourselves, and we must organize ourselves for the purpose of achieving our common prosperity through the work that dignifies us and increases our welfare, with the confidence in ourselves without which everything would waver around us, our determinations would be vain, and our steps uncertain in the direction of a sure and definite future of prosperity and greatness. The Philippines are open to the struggle with capital and the interests of other countries found here, and since we can not avoid nor reject this condition it is necessary for us to face it with courage and resoluteness. We must bear in mind the following authoritative words of a great thoughtful man and consummate politician who was lately president of the United States—Theodore Roosevelt.

"Let us, then, boldly face the life of combat, resolved to fulfill our duty well and manfully, determined to be honest and brave, to devote ourselves to a high ideal and therefor to make use of practical methods. Above all let us not shrink from any moral or physical struggle inside or outside of the nation once we are sure the struggle is justified, for only by struggle, by bitter and dangerous endeavor, we hope at last to reach the end of our true national greatness."

NETHERLANDS INDIAN FIBER CONGRESS AND EXHIBITION AT SOURABAYA UNDER THE DIRECTION OF THE NETHERLANDS INDIAN AGRICULTURAL ASSOCIATION (JULY 3 TO 8, 1911.)

DETAILED PROGRAMME.

In our preliminary notice of February 25, 1909, it was announced that a fiber congress would be held at Sourabaya, Java, Netherlands India, in October, 1910, under the auspices of the Netherlands Indian Agricultural Association (Nederlansch-Indisch Landbouw Syndicaat), with the support and assistance of the department of agriculture of Netherlands India, and that in connection with this congress an exhibition of machinery, fiber plants, and the fibers prepared from the plants would be held. In view of the limited time for preparation it has now been definitely decided to hold the congress and exhibition on the 3d, 4th, 5th, 7th, and 8th of July, 1911.

The aims of the congress and exhibition are to further the cultivation of fiber plants in the Tropics, to advise planters regarding the culture of fiber plants, to discuss points on which there are now differences of opinion, to attain uniformity in methods of production and product, and to arrive at a proper insight as to the value of cultivating fiber plants both on a large and a small scale. For these reasons the congress will attach particular interest to those fibers which practice has shown to have met with some measure of success and which have consequently attracted the attention of planters and capitalists. Only short discussions will be devoted to anything relating to what is merely in an early experimental stage or has repeatedly led to disappointment.

The intention is to exclude the discussion of cotton culture from the congress, but not to exclude cotton from the exhibition. Sourabaya appears to be unfavorably situated for an effective discussion of points bearing on this culture, which has proved to be remunerative to the natives in only a few disticts in Netherlands India. Ramie fiber will also be only lightly touched on, as experience with it has been universally discouraging. Coconut fiber will not be discussed.

PROGRAMME.

MONDAY, JULY 3, 1911, AT 6 P. M., IN THE THEATER AT SOURABAYA.

I. *Opening speech by the president of the Netherlands Indian Agricultural Association.*

II. *General review of the fiber industry.*

The congress will be opened in the evening of the first day by the president of the Netherlands Indian Agricultural Association.

In order to obtain an idea of the different questions relating to the cultivation and preparation of fibers, an introductory sketch will be given the same evening, in which the subject will be reviewed from botanical, technical, practical, and commercial points of view.

If possible, a short treatise on fibers will be published in order to leave as much as possible of the available time for discussion and argument.

TUESDAY, JULY 4, 1911, AT 8 A. M., IN ONE OF THE EXHIBITION BUILDINGS.

Cultivation and preparation of the Agave fibers.

The second day will be devoted to discussing the cultivation and preparation of the fibers, especially sisal hemp.

The intention is that various speeches will be made, each speaker taking a separate part in the matter under discussion. The botany of the Agaves, the suitability of various kinds for different districts, ground and climate, and especially particulars regarding the cultivation, such as plants, planting and attending to the plants, maintenance of the crop and catch crops, will all be discussed; after which the harvesting, the transportation of the leaves, the packing, the trade, and, finally, the prospects for this culture will be brought before the meeting.

If possible, a short demonstration illustrative of the methods of preparation will be given that day, entirely apart, however, from the tests of the machinery exhibits, which will be held on the fifth day.

There will be more discussion and debate than reading of papers, so that each speaker may relate his experience in order that all inquiries may be properly treated, and that each detail of the cultivation and preparation which is of importance may be thoroughly dealt with. The following points will be discussed: (1) Botany; (2) soil and climate; (3) plants; (4) planting; (5) maintenance of the crop; (6) catch crops; (7) harvesting and transport; (8) preparation (with demonstration); (9) by-products; (10) packing; (11) trade; (12) prospects, and estimated cost of production.

WEDNESDAY, JULY 5, 1911, 8 A. M., IN ONE OF THE EXHIBITION BUILDINGS.

Cultivation and preparation of Manila hemp.

The third day will be devoted to Manila hemp and Jute as well as substitutes for the latter. It is unnecessary to dilate here on the benefits to be derived from an exhaustive discussion of Manila hemp. *Musa textiles* is a plant eminently suitable as a native culture in tropical countries, nevertheless its extension on a large scale is impeded by the fact that its preparation is slow and consequently expensive, because no suitable machine is known for its preparation either on a small or a large scale. The discussion will so far as possible follow lines laid down for the discussion of Agave fibers and sisal hemp.

THURSDAY, JULY 6, 1911, AT 8 A. M., IN ONE OF THE EXHIBITION BUILDINGS.

On the fourth day the cultivation and preparation of kapok and pineapple fiber will be discussed.

I. *Cultivation and preparation of kapok* as follows: (1) Soil and climate; (2) plants, planting; as catch crop, maintenance; (3) harvesting, preparation, packing; (4) trade, prospects, estimated cost of production.

II. *Cultivation and preparation of pineapple.*

FRIDAY, JULY 7, 1911, AT 7 A. M., IN THE EXHIBITION BUILDING.

Testing and judging the machinery exhibits.

On the fifth day the trials of the exhibited machinery will take place. As soon as the necessary particulars are obtainable notice will be given as to which machines will be tested. The object of these trials is to give planters an opportunity of judging the merits of the machines which are necessary for fiber culture. An endeavor will be made to arrange the exhibits so that the different systems may be compared, thus enabling planters to arrange their preparing establishments in a practical manner.

SATURDAY, JULY 8, 1911, AT 8 A. M., IN THE LARGE HALL OF THE THEATER AT SOURABAYA.

Decisions arrived at with regard to the productiveness of the cultivation of fibers.

The sixth day will be devoted to the discussion of points relative to the productiveness of the cultivation of fiber, the presentation of diplomas, etc., as follows: (1) Sisal hemp; (2) Manila hemp; (3) fibers of the Jute species; (4) pineapple fibers; (5) kapok.

This meeting is especially intended for the collection and condensation of acquired data regarding the cultivation and preparation of fibers in concise form and the submitting of these data to the consideration of the fiber planters present. Information submitted to this meeting should, as far as possible, be concise on the following points:

(1) By what means can productiveness of the cultivation of the various fibers be achieved?

(2) With which cultures should experiments continue to be made?

(3) Which of the afore-mentioned cultures are unremunerative and for what reasons?

6 P. M., IN THE LARGE HALL OF THE THEATER.

(1) Report of the judging committee.

(2) Prize giving.

(3) Closing speech by the president of the Netherlands Indian Agricultural Association.

EXHIBITION.

GROUP I.—FIBERS AND FIBER-PRODUCING PLANTS.

Section A.—Collection of fibers, either growing or dried, which have hitherto not been prepared in Netherlands India for trading purposes.

Section B.—Fibers prepared for the European markets.

Section C.—Collections of plants, either growing or dried, from which fibers for the European market are prepared.

Remarks.—Exhibits in Section B should, as far as possible, be the usual trade samples, i. e., not fibers especially prepared for the exhibition, but the ordinary samples classified as is customary in the trade. The exhibiting of various assortments accompanied by quotations is strongly recommended.

GROUP II.—IMPLEMENTS FOR THE PREPARING OF FIBERS.

Section A.—Machinery for the preparation of Agave fibers: (1) Hand decorticators; (2) simple portable raspers; (3) stationary simple raspers; (4) stationary complex raspers; (5) decorticators of large capacity with automatic feed.

Section B.—Machinery for the preparation of Manila hemp: (1) Hand decorticators; (2) portable decorticators of greater capacity with driving power; (3) decorticators of large capacity with automatic feed.

Section C.—Machinery for the preparation of pineapple fiber.

Section D.—Hand machines for cleaning cotton.

Section E.—Machinery for separating the seeds from kapok.

Section F.—Machinery for the further manipulation of fibers, i. e., machines for preparing the fibers for the market.

Section G.—Drying apparatus for fibers.

Section H.—Packing machinery.

Section J.—Machinery for the manufacture of the by-products of fibers.

Section K.—Engines not forming a part of a decorticator.

Diplomas will be awarded for each section.

THE NETHERLANDS INDIAN AGRICULTURAL ASSOCIATION.
A. PAETS TOT GANSOIJEN, *President.*
D. J. R. PUTMAN CRAMER, *Secretary.*

COMMITTEE IN CHARGE OF THE CONGRESS AND EXHIBITION.

Honorary President.—The director of the department of agriculture in Netherlands India, Buitenzorg.

President.—T. Ottolander, vice-president of the Netherlands Indian Agricultural Association, Taman Sarie, Banjoewangi.

Secretary.—W. Birnie, solicitor, Sourabaya.

Treasurer.—D. J. R. Putman Cramer, secretary of the Netherlands Indian Agricultural Association, Sourabaya.

Members.—J. J. Benjamin, head agent of the Colonial Bank, Sourabaya; K. Heyne, chief conservator of the department of agriculture, Buitenzorg; G. J. Hupkes, director of the Netherlands Indian "Industry," Sourabaya; E. De Kruyff, chief bacteriologist of the department of agriculture, Buitenzorg; G. G. Schrieke, manager of Banjoe-lor estate, Banjoewangi.

Representative in Europe.—Dr. G. Van Iterson, of the Technical High School, Delft, Holland.

TOBACCO GROWING IN THE PHILIPPINES.[1]

By JOHN S. HORD.

I shall take two liberties with this subject. First, I shall make my address a short one, because any attempt whatever to go into the details of this matter would take up entirely too much of your time and reduce the opportunity for the general discussion which, I understand, is to follow my remarks. In the second place, I shall consider the matter of the proper curing and preparing the tobacco leaf for market, because a certain quantity, possibly a sufficient quantity, of good leaf is already being grown in these Islands, and the real problem to be solved, as I see it, is how to prevent the almost criminal methods whereby the good leaf after being cut and removed from the field is, with the rarest of exceptions, utterly ruined for commercial and industrial uses by the process of alleged curing, fermenting, and grading to which it is now subjected in the tobacco-growing sections.

Outside of the Cagayan Valley really good tobacco has, so far, only been grown in spots and places, and in such small quantities as to be fairly negligible. There are four or five plantations in the Cagayan Valley where good and properly cured tobacco is produced. About 90 per cent of the tobacco from that valley is raised by some 20,000 small planters averaging a little over an acre apiece. They plant from 10,000 to 12,000 plants to the hectare, or say 5,000 to the acre. This is not as many as one man can plant and pick, but it is as many as one man can properly care for after the picking, because 10,000 plants will yield anywhere from 160,000 to 200,000 leaves. If they properly cared for that number it would be all right, but they do not, and that is why the tobacco crop from that valley is nearly all wrong. Very few of these small planters have drying sheds; they expose the cut leaves to the direct rays of

[1] Paper read before the Agricultural Conferences at the Philippine Carnival, February 8, 1910.

the sun, which saps them of all aroma and toasts them so as to make of little avail the subsequent fermenting and pressing. Yet when I was in the valley a couple of weeks ago I found no one talking of putting up drying sheds nor of better methods of fermenting and preparing the leaf for market. But I did find them all talking of the bumper crop that they were going to raise this season and how they were going to put in double the area of land they had planted last year. The price of leaf tobacco went up amazingly last season, and those well-meaning but densely ignorant people are under the impression that the price of tobacco can perpetually go up at the same time that the quality of the leaf perpetually comes down. It is the duty of the Government, especially of the Bureau of Agriculture, to at once point out to them the fallacy of their reasoning and to demonstrate to them that a small crop of properly prepared tobacco has a much greater money value than a much larger quantity of weeds which can be called "tobacco" only through courtesy. If this is not done, and done quickly, in about another year the people of the Cagayan Valley will be cursing the Payne Bill instead of blessing it as they are doing at present.

Besides the really good, properly cured tobacco produced on a few of the larger plantations a certain small proportion of the tobacco raised by the 20,000 small planters is also found to be good and is mixed up with a immense mass of rubbish. Much of this comes to the Manila manufactories with the varying qualities of leaf all mixed up in the same bale. Anyone can convince himself of the truth of this statement by visiting one of the local manufactories and witnessing the constant occupation therein of sorting over anywhere from five to twenty bales of leaf labeled "first class" in order to get a quantity equal to one bale really of that quality. One of the largest purchasers of leaf in the valley systematically sorts all of the leaf purchased, retaining all of the good leaf found for use locally in the manufacture of cigars for domestic consumption and for export as cigars, and the remainder is exported in its leaf form to supply the government monopolies of Europe, which require tobacco not too high in price and therefore not too good in quality. And it is this phase of the matter which, I believe, presents the only real difficulty in the solving of the problem of how to improve the quality of the Philippine tobacco leaf. Due to the late increase in the price of tobacco in these Islands, the Government of Austria has already decided to suspend further purchases here.

Leaf tobacco is usually considered the raw material in the manufacture of cigars. Strictly speaking this is not true, properly cured leaf being really a semi-manufactured article. Just as in all industries the consumers decide how much they want of each grade of the product, so in the case of leaf tobacco the present and past trade with Europe, Asia, and Australia must be preserved and the new market in the United States must be added thereto if the maximum of the benefits anticipated from the passage of the Payne Bill are to be realized. In the past the government monopolies have used about 60 per cent of the 40,000,000 pounds of tobacco leaf raised in these Islands, and they must continue to be supplied with the quality of leaf they are willing to pay for. If their very reasonable request in this particular is not complied with, they will all go elsewhere for their tobacco. Spain imports more leaf tobacco to-day from the United States than she does from the Philippine Islands. This change has taken place within the last three or four years. But while preserving all of these old markets, enough first-class leaf should be produced—say, 15 or 20 per cent of the total crop—from which can be made the 150,000,000 cigars now allowed free entry into the United States. That trade can only become permanent through a radical change in the existing methods of curing and preparing that quantity of leaf. It is a problem well worth solving, and it must be solved because it can be solved. In all countries, to a greater or less degree, national prosperity rests, in final analysis, on agriculture. This is peculiarly true of the Philippine Islands. The agricultural base here is particularly broad and all embracing. From any and every point of view, and from all combined, the work to be done in future by the Bureau of Agriculture in these Islands can be considered by far the most important and responsible that has confronted the Insular Government in the past or which can confront it in the future. I believe that that duty will be well and thoroughly performed. It would, I believe, be a most grievous blunder of far-reaching effects to allow, at this crisis, an exaggerated notion of the evils of paternalism to obtain and to control governmental action. A generation ago the indigo industry of these Islands was ruined by tactics similar to those now being followed in the tobacco industry. Even now the hemp industry is far advanced along the gloomy road already travelled by the indigo industry. Of what avail to the people of these Islands will the free entry of our cigars into the United States market prove if the tobacco industry, the base on which the

cigar industry necessarily rests, is allowed to decay? Because of their ignorance or indolence, or of both combined, are the people of the Cagayan Valley to be allowed to inflict an irreparable injury directly on themselves and indirectly on everyone else in these Islands?

Nature has done wonders here in the way of a soil and climate, unsurpassed elsewhere, admirably adapted for the production of the very best tobacco leaf. Nature now grows good leaf, but man, begrudging his small share of effort, spoils it before it gets into the channels of trade. Spain had here in successful operation for one hundred years a system under which good tobacco leaf was produced. She abandoned that system several years before the time of the American occupation, not because of its inadequacy, nor because of any structural defect in the system itself, but simply because of the abuses which developed in its administrative enforcement and of the occasional cases of "graft" which were discovered in the classification of the leaf after it had been properly grown, cured, and prepared for market. The system in operation then was about as follows:

The seed beds were located on well-drained hillsides, were planted at the proper time, were cared for by the old men, the women, and the children, and selected seedlings were transferred to the fields and properly cared for while growing. Each planter, however small his holding, had a small drying shed of his own, inexpensively constructed of cane and cogon grass, where each leaf was properly cured and given the first fermentation before it was allowed to leave the premises where grown. Very inferior leaf was destroyed by burning. All of this work was done under governmental supervision, as was the grading of the leaf before it entered the channels of trade.

Compare that satisfactory condition with the deplorable one which obtains at present and which I shall briefly outline:

The traveling merchant and other purchasers in the Cagayan Valley, about the time that the seedlings are transferred to the fields, begin to advance money and goods on credit to the planters with crop liens as security. About the time the leaf is picked, or very soon thereafter, they demand payment of the debt by delivery of the leaf, whatever its condition, and they receive it "en partida," that is to say, unclassified. The planter wants further credit and delivers the leaf as soon as he can dry it a few days in the sun, the hotter the better, and has put it through the most perfunctory process of fermentation. It is no longer his property, and there is therefore no object for

him to put his leaf in proper condition, because to him, at least, such additional work will not enhance its value.

If this condition is tolerated for even one year more, can any sane man doubt, can the most buoyant of optimists deny, that the Philippine Islands will lose their tobacco market in Europe because of the high price and in America because of the low quality of the leaf?

AN INVESTIGATION OF THE LOCUST PEST IN THE PHILIPPINES.

By David B. Mackie, *Agricultural Inspector.*

The agricultural interests of the Philippines have suffered more or less for many years past from the inroads of locusts. The damage done is not confined to any particular island or group of islands, but during the past season reports were received most persistently from Negros and the provinces of central Luzon, although locusts were known to be present in Cebu, Leyte, Panay, and other islands. The southern provinces of Luzon seem to have suffered the least. As this past season was one of great drought, conditions were very favorable for the development of the pest, and it is safe to say that next year, unless preventive measures are adopted, the damage will exceed that of this year.

The locust feeds on most of the higher orders of plant life, but seems to prefer the cereal crops, and it is chiefly through damage to them that our agricultural interests suffer. Several genera, containing quite a number of species, are represented among the locusts in this Archipelago, but the species responsible for the greatest amount of damage belong to the genus *Acridium*. Such species are gregarious in their habits and from their earliest infancy assemble in immense swarms, traveling from place to place as they exhaust the food supply. It is a noticeable fact that they travel very little during rainy or cloudy weather. After they have matured and developed wings they spend most of the day assembled in vast swarms, generally in the open. When in motion, the swarm seems to follow no particular direction, but drifts along the lines of least resistance, which are generally open fields or roadways. They leave shortly after sunrise in the morning and about 4 o'clock p. m. seek the nearest high grass or standing vegetation, which they ascend and settle upon to pass the night. The

flying locusts generally prefer isolated clumps of bamboo or some other growth adjoining open land, and they frequently alight in such vast numbers as to completely obscure the trees, often causing them to break under their combined weight. They are strong fliers and often travel considerable distances when assisted by the wind; thus it is that districts which for years have not been visited by the pests may be suddenly overrun with them, while other localities which before have been badly infested may be entirely free from them.

LIFE HISTORY.

Only a few facts pertaining to this subject can be given, as the writer has made no attempt to work out the life history in detail. Young locusts, although exceedingly small when hatched, are very active and commence feeding within a few hours after leaving the eggs. The larvæ are not strong jumpers, however, until they are half-grown. They travel comparatively long distances, when it is considered that they proceed by walking and not by jumping. On the tracks of the Manila Railroad a swarm of locusts has been observed that traveled over 2 miles in one day. During the period of molting the insect ceases feeding and climbs upon a stalk of grass; after a short time the old skin splits along the back and the insect crawls out. For a little while it is very soft and unable to move, but in a few hours regains its activity. The insect changes upon completion of the different molts, the last molt being marked by the full growth of the wings, at which time the locust is ready to fly. Upon completion of the last molt, the mature insect, after spending a few days flying about with the swarm awaiting proper weather conditions, begins mating. Shortly after mating oviposition commences. The female arches the body and by the aid of two abdominal appendages known as palps, which she moves in a lateral direction, digs a small hole about an inch and a half in depth, generally curved forward. Often more than one hole is started, as the texture of the soil may be such as to prevent the insect's reaching the required depth, or a stone may interfere with the work. In this hole the eggs are deposited and covered with a frothy, viscid secretion, which later hardens and cements them into a solid mass which is impervious to the action of water. The period of incubation is ordinarily about six weeks, but may vary slightly according to the temperature to which the eggs are exposed.

NATURAL ENEMIES.]

Under natural enemies may be included those influences which are not controlled by the agency of man, among which may be mentioned insectivorous birds and mammals, parasitic and predacious insects, weather conditions, and natural tendencies which make for their own destruction.

Insectivorous birds and mammals.—In the larval stage the insect is persistently preyed upon by many different birds, especially crows, small hawks, and gallinaceous birds. When the swarms are in the vicinity of dwellings domestic fowls, especially turkeys, are instrumental in killing numbers of them. The fliers do not suffer so extensively from the attacks of birds, as they spend most of the day in flight, yet they are eaten to some extent by cuckoos, which catch them while on the wing. During the hopper stage the domestic dog eats more of them than any other mammal, and in badly infested territory dogs may be seen with their abdomens greatly distended, due to their stomachs being gorged with insects. The contents of the stomach of one dog which was accidentally poisoned was examined and over 1,500 locusts were counted. Other mammals, such as rats, shrews, insectivorous bats, and lizards, feed on the insects to a certain extent, but the number thus destroyed is so small as to be of no economic importance.

Insect enemies.—This matter has not been given much attention, but it is known that locusts are one of the intermediate hosts of certain species of hair worms and mites. Large hoppers of an inch or more in length are often attacked and killed by certain predacious bugs (*Hemiptera*) which resemble the wheel bug of the United States. Whether the larvæ are preyed upon by any hymenopterous parasites has not been observed, but as they are parasited in India and Australia by both hymenopterous (Ichneumon flies) and dipterous parasites (Tachina flies), also by flies that parasitize the eggs, it is probable that such parasitism occurs in these Islands.

Fungi.—As certain fungi are known to be parasitic upon locusts some experiments were tried with different fungi to test their adaptibility, but owing to atmospheric conditions they were not found feasible.

Climate.—Weather conditions form no important factor in connection with the increase or decrease of locusts. The young larvæ will stand a great amount of rain, and unless the district is flooded there will be no noticeable decrease. Droughts, unless

of sufficient length to destroy vegetation, produce no perceptible decrease. Typhoons are sometimes instrumental in destroying swarms of flying locusts by blowing them out over the ocean, but such are rare occurrences.

Cannibalism.—The tendency of the locust to this habit first came to our notice at the Alabang stock farm, and it is believed that in the use of accumulative arsenical poisons, such as arsenical sprays, this habit may later be made of some economic importance in dealing with the pest. In the instances of cannibalism observed no particular mode of attack was discovered; it is simply the process of one eating the other. Death does not generally result until the entire abdominal and part of the thoracic section is eaten. The weaker individual is attacked by a stronger member, or sometimes by two or three; the legs are often bitten off and eaten first, at other times the abdominal section is eaten first. The head is the only part not eaten, and this probably on account of the heavy mandibles.

METHODS OF DESTRUCTION.

Under this heading may be mentioned driving, killing with insecticides, either stomach poisons or contact sprays, and the use of a burning torch.

Driving.—This is the most popular and virtually the only native method of destroying locusts. It is practiced when the weather is dry and the locusts are traveling in large numbers in search of fresh food supplies. It is a simple method and when carried out properly is very effective. It is also economical, but is strictly a method of the open country and can not be successfully employed on land that has a standing growth of grass, such as cogon (*Imperata cylindrica*), which is the prevailing grass of the uplands.

First, the direction in which the swarm is traveling is noted, and at a suitable place a trench of variable dimensions, usually about 1 meter deep, 1 meter wide, and 3 meters long, is dug. Upon completion of the trench a fence about 5 meters long and 1 meter high should be built and placed in the shape of the letter V, with the large opening toward the swarm and the small one emptying into the trench. This structure may be composed of tin, boards, or any smooth material that insects are unable to climb. The corrugated sheet iron used for roofing is very good material and is generally obtainable in most of the municipalities. If none of the above-mentioned materials are available, earthen dykes faced with banana stalks may be used with success. When everything is ready a gang of say six to eight men with flags or

branches surround the swarm and drive it into the trench. Care must be taken not to drive too fast, because if approached too closely the locusts will become confused and attempt to escape in all directions. With proper care, however, they can easily be guided in any direction. After they have been driven into the trench they may be killed with boards or branches. If the trench has water in it, a small amount of kerosene poured on the water will do the work very effectively.

Use of insecticides.—Insecticides may be separated into two classes, those that act upon the digestive organs and those that kill by contact. The contact insecticides may be again divided into those that act on the respiratory system and those that are absorbed through the skin, both of which may be used successfully to combat the locusts. With insects like the locusts, which are preëminently leaf-feeders throughout their entire life and consume such a large amount of food per capita, a stomach poison naturally appeals to us as the most reliable. This may be applied either by means of spraying a soluble poison on foliage which the locusts will eat or by mixing it with some prepared bait which is spread in their path for consumption.

STOMACH POISONS.

Arsenate of soda.—A mixture of arsenate of soda and water at the rate of 1 kilo of the arsenate to 64 liters of water, with enough molasses to sweeten the mixture, was applied with a knapsack spray over an area of approximately 200 square meters of standing cogon grass, in the shape of a crescent, at the Government farm at Alabang, Rizal, on September 10, 1909, in front of a swarm of about three-quarter grown locusts. Conditions were favorable and the spray was applied to the grass at about 4.30 p. m., as at that time the insects were ascending the grass to feed and spend the night. The following day an examination of the sprayed area showed great numbers of dead insects and also numerous odd heads, proving conclusively that the stronger insects feed upon the weaker. On one square meter 2,060 dead locusts were counted. The foliage was badly burned by the arsenate applied at this strength.

The following day a mixture of one-half kilo of arsenate of soda to 48 liters of water, sweetened with molasses, to which had been added a small amount of zinc oxide to whiten it so there would be no danger of spraying the same place twice, was tried on a swarm of almost full-grown locusts. The swarm was in a small dry water course that was overgrown with

young rain trees, bushes, wild grass, and weeds. The insects were numerous and at the time of spraying were feeding; the noise they made cutting the foliage could be heard at a distance of over 15 meters. Weather conditions were favorable and the poison was sprayed on at about the same time, 4.30 p. m., as at that time there was little risk of the swarm's moving. About 250 square meters were sprayed. The next morning many dead insects were found lying beneath the bushes, but the foliage showed decided evidence of being burned. The leaves were all spotted and contained large dead patches. A subsequent examination made the same afternoon showed that the foliage of the entire poisoned area had turned brown, owing to the fact that the arsenate of soda had burned the leaves.

Experiments with the commercial article were then discontinued and later a home-made article was used, consisting of white arsenic, 2 kilos, and sodium carbonide, 1 kilo, added to 12 liters of water. To every 32 liters of water 1 liter of the stock solution was used with enough molasses to sweeten it. This was sprayed on standing grass and shrubbery which was infested with a swarm of almost full-grown locusts. Weather conditions were favorable, but the swarm was disturbed to a considerable extent, and, although many dead insects were found next morning, not as many were killed as should have been. The foliage was damaged to a considerable extent. This was the last of the experiments in which an arsenical solution was sprayed on standing growth.

From the experiments described above, it has been found that it is not advisable to use the arsenate of soda solution as a spray upon standing growth, unless this growth is of no value, as the arsenate is absorbed into the leaves through the stomata, thereby killing the plant tissues. Then, as the plant withers and dies, the insects do not feed upon it, so, unless it is eaten soon after it is sprayed, it is of no use as a killing agent. One advantage, however, is that as the sprayed foliage turns brown and dies the danger of stock feeding on it is partially eliminated. The price of arsenate of soda in Manila is ₱3 per kilo, which makes its use almost prohibitive.

Arsenate of lead.—In these experiments a home-made article was used, prepared from the following formula: 341 grams of sugar of lead dissolved in 4 liters of hot water. To this was added 124 grams of arsenate of soda previously dissolved in 4 liters of hot water, and by the combination of the two solutions a milky mixture was obtained. The lead arsenate separates slowly and may be recovered in the form of a thick

precipitate; 120 liters of spray were prepared from the above-mentioned ingredients and the results were very gratifying. In the case just mentioned the area was sprayed late in the afternoon, in the customary crescent shape, about 250 square meters being covered. The weather conditions were not the most favorable, as the sun was not shining and there was a thunderstorm gathering. This storm broke about 6 p. m. and undoubtedly washed off a large portion of the poison, but a sufficient number of dead locusts were found to demonstrate the efficiency of the poison. In fact, as this mixture has been used by the writer by the ton, sprayed at various degrees of strength, under all conditions of weather, and from machinery of every description ranging from the simple method where it is applied by being shaken from a broom which is dipped in a bucket of the mixture to the large steam and carbonic acid gas sprayer with a capacity of 12,000 liters a day and capable of being used on a stand of forest trees, there can be no doubt whatever regarding its efficiency. Arsenate of lead has some decided advantages over most other arsenical compounds in that it may be used at any strength and not injure the foliage, it is practically insoluble, and its adhesive qualities are great, one spraying being sufficient to last the entire season. The land sprayed by it, also, is easily recognized by a whitish color, thus averting danger to stock from feeding upon the foliage. Where careless application might cause injury these are all important factors. This insecticide is rapidly springing into favor with agriculturists, on account of the above-mentioned qualities, and is largely replacing Paris green. There are many commercial brands on the market which must be used in varying strength as the amount of arsenious oxide contained is not the same in any two, varying from 10 to 20 per cent, and consequently a different amount of water is required to obtain the correct consistence. Of the different brands now upon the market, that put out by the Vreeland Chemical Company (Electro brand) shows the highest percentage of arsenious oxide and relatively the least amount of arsenic in solution and is also one of the lowest priced of the commercial articles. This is probably due to its being made by an entirely new method. It can be bought in 45½ kilo buckets at 25 cents gold. When used at the rate of 14 kilos to 400 liters of water it makes a very attractive insecticide for all of the smaller leaf-feeders and could be strengthened for the larger ones. Its cost is about the same as that of Paris green.

Arsenate of soda.—As a poison for bait this is very effective,

but great care should be taken when using it to see that none is left lying around where stock can eat it, as they readily will if given the opportunity. In an experiment tried at Calamba, La Laguna Province, September 21, 1909, conditions were somewhat unusual, as the experiment was made on a large swarm of half-grown locusts that were traveling along the railroad track. Weather conditions were perfect and the time of the experiment was 10 a. m. A mixture of arsenate of soda made at the rate of about one-half kilo to 40 liters of water with enough cheap molasses to make the solution sweet and sticky was prepared, and cogon grass which had been exposed to the sun for fifteen minutes to slightly wilt it was soaked in the solution. This grass was then distributed thickly over the ground and was readily eaten by the locusts, being devoured in about fifteen minutes. One feature of the experiment which tended to lessen its value was the fact that the swarm was so immense, that, as the major part of it was on the track between the rails, traveling forward rapidly, the new arrivals literally pushed the ones that were feeding ahead and were in turn forced ahead themselves, thus being unable to eat their fill. The movements of this swarm were watched for over three hours, and great numbers of the insects showed evidence of poisoning by their lack of energy and also by their loss of the sense of direction, traveling in small circles of 2 or 3 inches in diameter instead of straight ahead. Cannibalism appeared here also, in that as soon as an individual showed evidence of weakening he was immediately attacked and eaten by the others.

Another experiment was tried with arsenate of soda, in which the same proportion of ingredients was used, but the method of preparation was slightly different. The water was boiled in one of the large iron dishes, such as are used to boil cane juice, and to this was added the arsenate, which was stirred until thoroughly dissolved, after which the molasses was added. It was noticed that by boiling the consistency of the mixture was improved and made more uniform. The cane was first kneaded about in the poison until it became thoroughly saturated, which process took about ten minutes, then removed to a large basket and a second lot added, and so on until all the poison was used. The exact amount of cane necessary to absorb the 40 liters of poison was not noted in this experiment, but when spread out in the path of a traveling swarm of nearly mature locusts, it covered an area which exceeded 100 square meters. The locusts ate this cane eagerly and did not stop until they had devoured everything but the tough outer husk. Better results were obtained in this

experiment and were the more manifest as the area was larger and the entire advance of the swarm was checked. This experiment was, however, greatly interfered with by inquisitive natives who persisted in wandering in amongst the poisoned baits and disturbing the feeding locusts. Arsenic, carbonate of soda, and molasses were tried, with practically the same results as in the previous experiment.

CONTACT INSECTICIDES.

Pure kerosene.—As the price of this article renders it prohibitive if used in a pure form, it was experimented with once only, at the stock farm at Alabang, Rizal, where the locusts were causing considerable damage. Pure kerosene was poured on some puddles of water which were in the path of a moving swarm of locusts. Upon arrival of the swarm at the water many jumped boldly in, but few reached the other side, although the distance was but slightly over 1 meter. Soon, however, the entire surface of the pools became covered with dead locusts and the remaining ones were able to walk over on them.

In another experiment the pure oil was sprayed upon nearly full-grown locusts, which were killed almost immediately upon coming in contact with the oil.

It was also tried on a swarm of mature insects as they settled on a clump of bamboo for the night. The insects were sprayed heavily and fell to the ground in immense numbers, but some were able to fly off again. On the following morning examination showed many dead insects and some that were yet alive, although unable to fly. As this clump of bamboo was surrounded by a growth of talahib (*Saccharum spontaneum*) which was over a meter and half high any careful search for the dead insects was impossible. The kerosene was tried on this swarm because conditions were unfavorable for the application of internal poison and their appearance demanded immediate attention.

Crude petroleum.—This was sprayed upon a swarm of nearly mature locusts, resulting in almost immediate death. Although this might be an expensive spray for use on an extended area, yet as the insects travel in very compact bodies and as only the small territory actually covered by the moving locusts would be sprayed, comparatively none of the oil is wasted when any care is taken in applying it. It can be bought at the rate of 18 centavos per imperial gallon, landed in Manila.

Crude petroleum used as a burning torch.—Crude petroleum has a decided advantage over other contact sprays in that during rainy weather the spray pole can be converted into a powerful

burning torch. If the nozzle is mounted on a 2½-meter pole, a flame of about 1¼ meters long can be obtained, and as this flame rests about one third of a meter from the nozzle there is no danger of melting the parts. An experiment of this nature was carried on in Laguna Province. Rain was falling heavily and the locusts were in high cogon, but in spite of the rain the grass was ignited and the whole swarm destroyed. The only drawback to this method is the intense heat to which the operator is subjected. This burning method is doubly effective, in that it kills the pests and clears up the grass at the same time. A new growth shortly springs up that affords better pasture for stock.

EXPERIMENTS ON CAGED SPECIMENS.

This is practically a complete list of the field experiments tried thus far, though a few have been tried on caged specimens. These latter experiments were conducted to determine the length of time required before the effects of the poison are manifested, and also the extent to which it could be communicated through the locusts themselves. In one instance fifteen three-quarter grown locusts were fed on cogon grass which had been soaked in a solution of 1 to 10 of the commercial arsenate of soda. The food was put into the cage at 10.30 a. m. and the insects commenced feeding immediately. At 2 p. m. they began to show symptoms of poisoning and by 4.30 they were all dead. The remaining food was then removed and fifteen more locusts were put in, but they did not seem to care particularly for their dead brethren and only three were partially eaten.

The same experiment was repeated next day, and this time the second lot was put into the cage soon after the first lot began to show signs of poisoning. Lot No. 2 soon began to feed on Lot No. 1 and before two hours had eaten nine of their comrades. The following morning only three insects were alive in the cage. As there had been but six left of Lot No. 1 it is safe to conclude that the three remaining alive were not of that lot. The three living ones were put into a cage with five healthy specimens, which ate them. As no deaths occurred among Lot No. 3 we must draw the conclusion that the three living ones of Lot No. 2 had not eaten sufficient poison to affect the ones eating them, or that the strength of the poison had worked itself out.

The results of these experiments prove that by this method advantage may be taken of the cannibalistic tendencies of the insect and that if poison is made of an accumulative nature and

used on a large scale this tendency of the insects could be so directed as to bring about their own destruction.

OTHER METHODS.

A new method, a trial of which proved that it is worthy of further recognition, was the use of a windrow of hay soaked with crude petroleum to act as a repellant to keep the hoppers out of planted crops. In this experiment a heavy crude oil supplied by the Bulldog Oil Company, of California, was used. The results were very satisfactory and the hoppers kept away from it, not even attempting to cross it. The only attention the hay needs is to be shaken up about once a week and wet down with oil every second week. Such barriers can be laid along roadsides and whole sections may thus be kept free from the insects.

The method in use against the rice bug in British Guiana, which consists of a bag stretched on a frame and rapidly drawn over standing crops, suggested that the idea might be modified and used to advantage against the locusts, and on reading some of the reports of the Agricultural Research Institute, of Pusa, India, it was found that this method has been perfected and is one of the most popular methods of dealing with the locust pest in that country.

The following is taken from a pamphlet sent through the kindness of H. Maxwell-Lefroy, esq., entomologist to the government of India, who states that this is the common method employed against the pest in India:

Sufficient strips of cloth are taken, each 14 feet long, sewn together by their long edges to make a piece 14 feet by 6 feet. The two ends are then brought together and the sides sewn up. This makes a flat bag, to which strong cloth tags are sewn, the first at one seam, the next 2 feet from that, the third 4 feet from the second, the fourth 2 feet from the third and 4 feet from the first. Bamboos of 2 feet length are fixed between the two pairs of tags 2 feet apart and the bag is ready.

The frame is made of four pieces of bamboo, each 4 feet 3 inches long, laid in a square, the ends of two bamboos on the ends of the other two. Two crosspieces of split bamboo, each 5 feet 8 inches long, are laid diagonally across the square. Two pieces of bamboo, each 2 feet 3 inches long, are placed upright at the corners of one side, and two split bamboos, each 4 feet 8 inches long, are placed from the top of these uprights to the nearest corner. A crossbar, 4 feet 3 inches long, is then placed to unite the top of the two uprights. As the bamboos are placed in position they are bound with string or fiber in the order given above. Enough bamboo should project at the ends to allow of their being bound together. This makes a frame, to the front of which the bag above is attached by the tags.

In these figures, 3 inches extra length is allowed to permit of the

bamboo being bound; the resultant frame is then of the size to accommodate the bag. The 2-foot long bamboos used for keeping the bag open are inserted only when the bag is used alone; when the bag is attached to the frame, these bamboos are removed and the tags of cloth knotted to the frame, so that the bag can be at once removed and twisted up. In place of bamboo, strips of wood may be used.

The dimensions given are those found handy for one or two men's work. Large bags for open lands may have an opening 12 feet wide, 2 feet high, and a depth of 8 feet. In this case the bag should be weighted with pockets of sand sewn into the lower edge of the mouth and the corners of the back. Two men can manipulate such a bag and cover a large area of land.

WELL-KNOWN INSECTICIDES.

Before leaving the subject of these various methods of destruction, a list is given of different poisons which, although they have not been experimented with in the Philippines, are well-known insecticides. Their efficiency has been thoroughly demonstrated, and some facts concerning them may, therefore, be useful to our readers.

Arsenate of lime.—This is one of the most powerful arsenates and one of the most powerful of the homemade articles. One of the easiest ways to prepare the homemade article is to take 1 kilo of white arsenic and one-half kilo of carbonate of soda. These should be mixed dry and later enough water added to reduce them to the consistency of a paste. To this add 4 liters of water and bring the mixture to a boil, letting it boil about five minutes. There should be no sediment. This can be bottled for future use and when needed slaked with about 1 kilo of lime and 8 liters of water to 1 liter of the arsenical mixture. Mixed with 120 liters of water this should be strong enough to kill grasshoppers in any stage of development.

Paris green.—This is one of the oldest insecticides on the market. It does not remain in suspension well and needs frequent agitation to insure the best results. Cheap commercial mixtures are liable to contain a certain amount of the arsenic in solution. Its adhesive qualities are not great, either, as the spray is mostly washed off by the first shower. The commercial article sells at about 32 centavos per kilo and at this price makes a cheap spray. With proper care there is no reason why excellent results should not be obtained and any failure may be attributed to carelessness on the part of the user. The commercial article is often diluted with sand, white arsenic, etc., but the standard articles are rarely subject to adulteration. A spray made up of Paris green, one-half kilo, water 500 liters, and lime freshly slaked one-half kilo should be effective on locusts at any stage.

Schules green.—This resembles Paris green. It remains in suspension better, contains a higher percentage of arsenic, and is cheaper. However, it is not extensively used.

London purple.—This resembles the preceding. Although it contains a somewhat higher percentage of arsenic, it is liable to contain also more arsenic in solution, due to its being a by-product, and therefore unreliable, as of varying composition. A spray composed of London purple one-half kilo, quick lime 2 kilos, and water 500 liters used the same as Paris green is very effective.

Sanitary fluid.—This is one of the crude carbolic-acid preparations and has been highly recommended by the Indian government. It is possible to secure it in commercial quantities at a cost of 2 rupees (about ₱1.28) per 20 liters, and this used at the rate of one can to 150 gallons of water should, provided it is effective, make a very inexpensive spray.

Arsenate of iron.—This is a new insecticide which is not yet on the market in commercial quantities. It has, however, been tried and has been found effective without damaging the foliage. It is said to be the by-product of certain ores, after crushing. It is used in the proportion of 2 kilos of arsenate of iron to 400 liters of water.

SPRAYING APPARATUS.

Apparatus for using insecticides in the Philippine Islands must be inexpensive, simple in construction, and light and easy to transport. The following is a list of the apparatus used in a series of experiments, which gave very satisfactory results when tried under the different existing conditions, such as for distributing poison sprays and for use as a burning torch.

A set consists of one Gould bucket pump (the common disinfecting pump), with a length of hose 7½ meters long, to which is attached a 2½-meter length of quarter-inch iron pipe, on which is mounted a spray nozzle (the couplings and nozzle are supplied with the pump); two cans holding about 20 liters (in experiments empty kerosene cans were used), one for use with the pump and the other in which to mix the spray; and two iron buckets for carrying water and for emergency purposes. The above-mentioned articles may be purchased in Manila for the following prices:

Pump and connection	₱6.87
Hose per ⅓ kilo	.30
Pipe (iron) per ⅓ kilo	.05
One Stilson wrench	1.50
Total	8.72

The advantages of this kit are its comparatively low cost, its simplicity, its weight, its durability, and its adaptability to the different methods. To the casual observer it might seem that these pumps would be insufficient in capacity for the economic distribution of the insecticides, but as the swarms are compact and are easily surrounded when found, the infected area may be sprayed and the pumps moved quickly across a ravine or over other equally difficult ground where, on account of the absence of good roads, it would require considerable time and expense to move a power pump.

Method of applying spray.—When the insects begin to manifest a desire to stop and feed, which they do between 3.30 and 5 p. m., the place where they will spend the night can easily be located, and by having a party on the outlook the movements of the different swarms may be followed and the apparatus made ready at the location selected.

The greatest care must be exercised in applying the sprays, for by carelessness in its application the spray will be wasted by being unevenly distributed and some places left untouched by the poison, thus allowing a number of the insects to escape unharmed.

Experience seems to show that by starting two sets of men at a point ahead of the swarm and working laterally in the form of a V which will be large enough to reach the edges of the swarm, the insects can be forced toward the center, into a smaller area and more compact form. Under ordinary conditions, where the locusts are feeding on cogon or other grass, the work should be completed in about fifteen or twenty minutes. Not over 60 liters of spray will be required to spray an area in front of an ordinary swarm. By a careful check on work done it has been found that 1,056 liters will cover 1 hectare of grass land. Allowing for the necessary stops for filling, etc., one-half hectare could be covered by one pump in eight hours. The total cost of spraying 1 hectare is about ₱9, including cost of materials and labor for spraying.

THE CULTIVATION OF THEOBROMA CACAO OR COCOA.[1]

(Continued.)

By A. Fauchére,

Assistant Inspector of Agriculture in Madagascar.

PRUNING.

All authors who have written upon the cacao agree as to the importance of pruning. But no one, I believe, has attempted to impose definite rules that must be implicitly followed.

According to nearly all authors pruning of the cacao consists of little more than careful lopping at regular intervals of the dead wood and the branches that extend too far.

The planters of the different cacao-producing countries do not agree as to the utility of pruning. In Trinidad and Surinam they prune everywhere with more or less care. In Venezuela they content themselves with taking out the suckers. In Ecuador the cacaos grow as they will; they are never pruned and the suckers are never taken out; but here as elsewhere the trees live long and produce well. Trinidad and Surinam planters hold that pruning is quite indispensable, while in Ecuador it is considered unnecessary. These differences of opinion among men who succeed equally in cacao culture may be explained, I think, by the different environments in which they operate. In lands of great fertility like those of Ecuador the cacao is able to produce abundantly and live long in spite of the lack of pruning. But in soils that are not so rich, like those of Trinidad and Surinam, it is an established fact that judicious pruning increases the production and prolongs the life of the trees.

The process which in some cases passes for pruning is certainly bad for the cacaos. Under the pretext of pruning some

[1] Extracts from a series of articles, entitled "Culture pratique du cacaoyer," published in *L'Agriculture Pratique des Pays Chauds*, beginning in April, 1905.

managers of plantations subject the trees to veritable mutilations by using dull and primitive instruments. When I wrote the word "pruning" at the head of this chapter I certainly did not intend it to apply to the barbarous operations I have witnessed in cacao plantations on the east coast of Madagascar. I mean by "pruning" a cultural process, based on reason and directed toward a definite end, resulting in augmented production and longer life of the trees. In short, I am convinced that while pruning the cacao appears to be unnecessary in very fertile soils, it will produce good results in plantations where the soil is of ordinary richness, and it seems to be absolutely indispensable to carefully prune the trees planted on soils that are not very rich.

This opinion is based in part upon observations I have made during my visits to the beautiful cacao plantations of the Antilles and the Guianas, and principally in the Voorburg plantation in Dutch Guiana, directed by Mr. Goefken. This plantation covers an area of 95 hectares, and the trees upon it are in admirable condition.

In the well-kept plantations of this Dutch colony each cacao tree yields an average of 1.5 kilos of dry seeds. The trees are planted at 16 feet, and the mean production of a hectare is 550 kilos of commercial cacao. Mr. Goefken obtains the largest returns; in 1901 95 hectares of cacaos yielded 101,000 kilos of dry cacao. His soil is exactly like that on the other plantations, and he does not manure it. I firmly believe that these excellent results may be attributed solely to very thorough pruning.

Upon the Jagtlust plantation, the largest in Surinam, very large returns are also obtained, sometimes greater than 2 kilos per tree. Manuring is not resorted to, but trimming and pruning are done very carefully.

A cacao that is never pruned surrounds itself with numerous suckers, which become entangled with the branches and shut out the light. The least harm that can result, if the soil is very fertile, is diminution of production, for it is well known that light has a considerable influence upon the fruitfulness of trees. It is probable that even in Ecuador the cacaos would produce more heavily if they were relieved of their suckers. When the soil is of slight or mediocre fertility, allowing the trees to grow entirely without pruning has bad results, since, as was said before, it shortens their lives.

If the development of cacaos that are not pruned is followed, it will be noticed that in a short time one of the many suckers

that surround the trunk begins to develop considerably. It forms a new trunk which grows straight up with extreme rapidity, so that it is soon higher than the top of the tree. The development of the original tree is arrested, and the tops of the branches, deprived of their nourishment by the sucker, gradually die. The branch which has taken the place of the original tree top remains vigorous for two years at most, after which it produces some fruit. As soon as it has lost some of its vigor other suckers appear upon it, developing as it has done, and finally exhausting and even killing it. Thus the tree continues to form a new top about every two years, constantly exhausting itself and producing little. The cacaos that grow in this fashion present a very bad appearance. The extremities of the old branches are dried, the fruit grows smaller as the decrepitude increases, and the yield is small at the age when the trees should be in full bearing.

This is what one sees in an unpruned cacao plantation, and is what leads me to believe that pruning to a moderate extent is indispensable in maintaining the cacao in a satisfactory state of production for a long time. I believe, too, that judicious pruning tends to augment the production to a larger extent. The object in pruning the cacao is the same as in pruning all other fruit trees. The planter prunes in order to regulate and equalize the development of the different parts of the trees, to enable light and air to penetrate freely, to regulate the production, and, finally, speaking particularly of the cacao, to lengthen the tree's life by preventing the excessive production of suckers.

All efforts tend toward clearing out the interior of the tree so as to form a sort of goblet, as is done with European fruit trees of regular form and high trunk. The cacao's special manner of development makes this result easy to attain. At about one year of age, when the young trees are 0.75 or 1.2 meters high, the trunk begins suddenly to branch in a very characteristic manner. At the top a whorl of from three to six branches is formed. These branches grow obliquely and form a sort of vase. There are no exceptions to this rule. The trunk of the cacao is always terminated by a whorl of branches, known under the name of "lélé" at Martinique. The possibility of giving the cacao a particular form is thus limited by its manner of growth. It is very rarely that the planter is called upon to force the young cacaos to put out their first branches.

When the branches are well started and 35 or 40 centimeters long the question of cutting out the superfluous ones comes up. In Surinam three branches are saved—never more than three.

The Dutch planters told me that when the young trees have formed more than three branches, three take the lead and develop vigorously, while the rest are backward in their growth. It is as if the cacao tree itself eliminated them. In Trinidad three branches are usually saved, though where the soil is rich four are sometimes left. In cutting out the primary branches account must be taken of their vigor and their respective positions. The less vigorous are removed. It is not well to wait until the branches are very large, but the Dutch planters of Surinam all agree that it is well, especially when the trees are young, to cut the cacao as little as possible, in order to avoid wounds whose scars are often troublesome.

Topping of cacao trees is almost never practiced in Surinam and Trinidad, but if a tree grows too high before forming its verticil the trunk is pinched back, so that the whorl of primary branches will not stand higher than about 1.2 meters above the ground.

It is generally useless to interfere with the formation of the first whorl. The tree naturally terminates in a number of primary branches, which can be thinned to the desired number. If these first branches develop equally, it will not be necessary to top them, though they usually ramify too abundantly. It is only when the growth is very unequal and one or two branches develop much more rapidly than the others that they should be checked. When such is the case the extremities of the most vigorous should be pinched back, and the more backward ones given a chance to equal them. In short, a perfect equilibrium should be striven for in the primary branches that are to form the framework of the cacao. These primary branches bear leaves that are opposite and horizontal in direction. They tend to branch, therefore, on their lateral sides. When by chance they produce branches on the upper side these should be cut off if they shoot straight upward and tend to become suckers.

Among the branches which develop on the lateral sides of the primary branches the superfluous ones are suppressed, also those which are too near the main trunk, because they would ultimately crowd the center of the tree. They should not be allowed to grow within 30 or 35 centimeters of the trunk. If these secondary branches are too numerous, some are taken off in such a manner that of the remaining ones those on the same side of the primary branches are at least 25 or 30 centimeters apart.

Pruning may stop with this; but if it is desired to perfect the form of the cacao tree, pruning may be extended even to the

third set of branches, the method being the same as that used for the secondary branches—those which are too close to the base being removed, and when necessary those too close together on the lateral sides being thinned out. This is as far as pruning, properly speaking, can be said to extend. The tree has been given its proper form. After this, every two years, the cacao should be carefully trimmed. The trimming should be done by trained workmen. They should cut out the dead branches with great care, and aim always to thin out the interior branches so that light and air will not be excluded from any part.

But while judicious and regular trimming is necessary, it should be recognized that there is danger of overdoing in this regard. In many plantations in Trinidad I have seen cacao trees evidently suffering from too much cutting of their branches. The branches and leaves are the organs of nutrition, of which the tree should not be deprived without good reason. The leaves, as is known, constitute the laboratory in which the tree prepares the nourishment that comes from the roots for the transformation into the elements that accumulate in the fruit. When too many branches are removed, and the leaves, of course, with them, the yield is necessarily reduced, the plant's power of assimilation being reduced. Further, a plant that has been excessively pruned must form new branches and new leaves, thus losing much strength that would otherwise be used for production. In conclusion, I believe, as a general rule, that when the frame of the cacao is formed on the plan indicated above, trimming every two years will be sufficient to regulate the form of the tree, to keep the interior properly out, and to cut off the dead wood.

The elimination of suckers is not necessarily included in the subject of pruning. If they were destroyed only every two years, when the trimming takes place, many of them would be able to do much damage, and in cutting them out large wounds would be made, the healing of which might be a very long and problematic process. The suckers represent an amount of energy that is lost to the tree, and they should be removed as soon as they appear. The laborers usually attend to this when they do the weeding.

It is scarcely necessary to recommend that a very sharp instrument be used for pruning, and the branches cut very close to the trunk, in order to avoid leaving stumps which dry out and often occasion cankers that result in the death of the tree. If for any reason it is necessary to cut off branches of considerable diameter and thus make large wounds, these should always be daubed with tar to protect them from dampness.

The best time for pruning the cacao would seem to be during the cool season, when the activity of vegetation is at the minimum. In actual practice the work is accomplished after one of the two harvests, when there is very little fruit on the trees and they are not yet in flower.

I have said in the preceding paragraphs that suckers should be relentlessly destroyed. But after having condemned these parasitic branches it must be admitted that under some circumstances their presence is useful. When the top of the tree begins to die prematurely one of these suckers growing upon the trunk may be used to form the new top. The most vigorous looking specimen is chosen and all the others eliminated, in order to conserve the strength of the tree. As soon as the development of the sucker warrants, everything above this new trunk is removed, and thus a strong new tree is the result. This method of rejuvenation is much in use in Dutch Guiana.

NOTES ON GINGER.

Compiled by HARRIET HAYES.[1]

The mother plant of ginger (*Zingiber officinale* Ros.) is an herb indigenous to tropical Asia, and is cultivated in numerous countries of the Tropics. It grows from 1 to 3 feet high, and the flowers come off on separate branches from the root stalk. Commercial ginger consists solely of the rhizome, a stout underground root stock, known to planters as the *race*, and should not be confused with the true root. The most highly esteemed ginger is that which has these rhizomes in the form of straight "fingers" regularly developed. This well-formed growth is possible only in soil that has been previously well worked and put into good condition.

The requirements of ginger with regard to the fertility of the soil are fairly high. The soil must not be too heavy and not swampy. A sandy loam which is also chalky is most favorable. Ginger is propagated exclusively by means of pieces of rhizomes, which are kept in dry places and which shortly before planting are cut up in bits 3 to 5 centimeters long, each of which must have at least one bud. The fields are laid out in the same manner as a potato field, most suitably with ridges 3 decimeters and furrows 8 decimeters wide. The pieces of tuber are placed on the ridges in holes about 8 to 10 centimeters deep and 25 to 30 centimeters apart. These are well filled up with earth so that the tubers lying in the holes do not decay.

The ground should be, as was said above, well tilled and carefully weeded before planting, for if much weeding is done while the crop is growing, water may come in contact with the rhizomes and cause them to rot. In damp places the soil must be carefully drained, for stagnant water is fatal to successful

[1] Compiled from the following authorities: "Agriculture in the Tropics," by J. C. Willis; "The Tropical Agriculturist," Vol. XXV, No. 2; "The West Indian Bulletin," Vol. IV, No. 1, etc.

culture, the ginger under such circumstances being attacked by black rot, and the rhizomes acquire a bad odor and flavor.

The yield from a ginger field amounts as a rule to from 1,100 to 1,700 kilos per hectare, but it is said that as many as 2,200 kilos per hectare have been gathered. At the present price of ginger a considerable profit per hectare might be expected. The cultivation requires manual labor, however, which makes it too expensive to grow ginger on plantations; moreover, the ginger plants exhaust the soil very much, so that repeated cultivation on the same soil is only possible with a considerable amount of fertilizer.

The harvest commences when the parts which are above the ground are withering, a stage reached usually in from nine to eleven months. If left too long the rhizomes thrown up aërial stems and become tough and fibrous. In removing them from the soil great care must be taken not to break or bruise them. Further treatment always begins with cutting off the roots from the carefully washed tubers. From that point the treatment varies according to the form of the product desired.

Dried ginger.—In dried ginger a distinction is made between peeled or white and unpeeled or black ginger. In preparing peeled ginger only the thinnest possible skin may be removed, as the aromatic constituents are present in the portion just beneath the epidermis. After peeling, the rhizomes are immediately placed in clean water, which should be frequently changed in order to obtain the best color. The pieces peeled during the day are left overnight in water and are then dried.

The drying process requires from five to eight days, during which the ginger loses about 70 per cent of its weight. On a large scale the drying is done in a "barbecue," a paved and cemented surface slightly convex, situated so as to obtain the greatest exposure to the sun's rays. Small planters use a drying hurdle, formed of pieces of wood placed side by side and covered with banana or palm leaves. The ginger should be carefully turned over at least once daily during the process of drying. London brokers report that the ginger must be quite dry in order to be salable on that market. In the case of peeled ginger, great value is attached to a bright and, as much as possible, white color. It has been tried to improve the color of the ginger tubers by chemical agents (chloride of lime, plaster of paris, etc.), but it is very inadvisable to do this.

To prepare unpeeled or black ginger, the rhizomes, after having been carefully cleaned, are placed in boiling water for a few minutes and then dried.

Preserved ginger.—Preserved ginger comes largely from Canton, China. The preparation of preserved ginger takes place in the following manner: The washed, boiled, and peeled tubers are placed in earthenware vessels, and a boiling solution of sugar (1 kilo sugar and 2 liters water) is immediately poured over them. After twenty-four hours this solution is drained off, heated, and poured back into the vessel. This is repeated after two days. The ginger can then be taken out of the solution of sugar and dried or sent away direct in jars.

Oils and essences.—For distillation it appears that certain kinds of ginger are more suitable than others. Shimmel & Co. distill only the African variety imported from Liberia, as it contains two or three times as much oil as Jamaica ginger. For instance, whereas African ginger yields 2 to 3 per cent, Jamaica ginger only yields 1.075 per cent essential oil. For the preparation of unrefined oil of ginger there would seem to be two methods: First, steam distillation of the ground roots and subsequent separation of the volatile oils from the aqueous distillate; and, second, extraction of the ground roots with strong alcohol, with subsequent recovery of the alcohol by distillation, which would leave the ginger oil in the residue along with waxes and other extractives in the form of *essence concrete.*

The necessary apparatus for working the second process consists of a grinding mill, a metal vat, a hand-power screw press, and an ordinary copper still with metal coil condenser. Of course the operation of such a still would require running water, and the size of the apparatus would depend upon the quantity of roots to be treated. Such an outfit would be very inexpensive and easily operated, but would produce crude concentrated extract only. For the recovery and rectification of the essential oil much more elaborate and costly equipment would be necessary.

The equipment as outlined would be all required for treating ylang-ylang, champaca, vetiver, etc., for the preparation of "essence concrete" of these materials. In the initial stages of the industry the concentrated extracts of ginger oil or other products could be put in marketable form in Manila, where apparatus is already installed.

It is also possible to make a separation of the terpines in the production of terpineless ginger oil, although I would imagine from the great differences in quotations on ginger oil and terpine-free ginger oil that the yield of the latter would be very small and the demand for such a product somewhat limited.

Other products.—Extract of Jamaica ginger is made by extracting the ground roots with strong alcohol.

Ginger ale is made by extracting the ground roots with very dilute alcohol or water.

The residue left in the production of extract of Jamaica ginger or of ginger ale is called exhausted ginger and is used as an adulterant in ground spice.

Market prices.—Recent United States quotations for Jamaica unbleached ginger root are 12 to 15 cents per pound (52 to 66 centavos per kilo), and for Jamaica bleached ginger root 16 to 17 cents per pound (70 to 75 centavos per kilo).

Dried root is valued at 20 to 30 shillings per hundredweight (88 centavos to ₱1.32 per kilo) on the London market.

CURRENT NOTES.

PHILIPPINE COPRA CROP.

According to figures which have been recently compiled for the past year by persons in this city interested in this industry, the Philippine Islands produced 1,658,724 piculs of copra, making the Islands the largest producer of this staple in the world, and excelling in product Java, Straits Settlements, Ceylon, and the South Sea Islands. These data not only show that the copra industry in the Islands is in a most healthy condition but that copra has risen to ₱11 a picul. This rise in price has taken place within the past few months. On February 1 it was quoted at ₱10.25 and later advanced to ₱11. The production of copra in the Philippines for the past four years is given as follows:

	Piculs.
1906	927,942
1907	844,909
1908	1,345,166
1909	1,658,724
Total	4,776,741

Approximately 103,000 tons, or about one-third of the world's production, is grown in the Philippines. The reasons for the steady rise in the price of copra are many. The principal ones are the extensive use of its products for commercial purposes, for making edible fats, such as "palmin," also the rise in price of articles now being supplanted by copra products. At the present time there are several factories in Germany engaged in making imitation butter, "palmona," and other edible products from the meat of the coconut. Another item which contributes to the rise in price of copra is the shortage of fats of all kinds due to the scarcity and high price of hogs. Lard, for instance, has risen to about 65 centavos a kilo, which is double what it cost two years ago. Cotton-seed oil, which has been used extensively in place of pork fat, has also risen in price to such an extent that the use of copra products has become imperative. Copra products are also being used as a substitute for tallow.

There is also a growing demand for coconut oil, for which millions of coconuts are being used every year. It would seem that the prospect for the coconut industry in the Philippine Islands is brighter than ever before.

INDUSTRIAL SCHEDULES BY THE BUREAU OF EDUCATION.

One of the most satisfactory moves on the part of the Bureau of Education was the pamphlet entitled "Industrial Schedules" recently prepared and sent out to the division superintendents and supervising teachers in all parts of the Islands. This pamphlet was prepared by the Philippine School of Commerce and requires an investigation of the principal commercial towns, ports, and markets in each province; of the rice, corn, and minor food crops; fruit, oil, and fiber industries; of agriculture in general; the animal industry, forest products, minerals, household industries, manufactures, etc. This work by the supervising teachers and superintendents, which will necessarily consume a great deal of time, will turn the minds of thousands of children in the schools toward the resources of their own country, and especially to the resources of their particular section and community. The character of the industrial work carried on by the schools in the different parts of the Islands we believe should be determined largely by the results of these investigations, and that in most cases the industrial work will naturally be along those lines for which the natural resources of each community furnish the necessary material. While we would in no way make light of the value of intellectual training and culture, in the Philippines perhaps more than in any other territory under the Stars and Stripes should that training be emphasized which makes efficient citizens. We believe that just as definite results should be required from money invested in education as from money invested for any other public improvement.

SAN RAMON FARM.

The Mindanao Herald states that the authorities of the Moro Province have decided to move the provincial prison from Calarian near Zamboanga to San Ramon and utilize the labor in carrying on the work of the farm. The present provincial jail will be used as a municipal and detention jail, and a substantial building of reinforced concrete will be erected for the prisoners on the farm. In this way the Moro authorities believe that they can make the provincial prison a self-sustaining institution. The prisoners will be employed in the cultivation of such crops as rice,

corn, camotes and other vegetables, which will be used for the subsistence of the laborers, as well as in the cultivation of the larger crops of the farm. There are now 5,000 coconut trees in bearing, and 3,000 more trees will begin bearing within the next two years. It is the intention of the authorities to stock the farm with cattle, hogs, and goats of selected varieties. There will also be a nursery which will furnish coconut seed for stocking other plantations in the province. According to the report of the treasurer of the province for the last fiscal year the receipts for the sale of the products from the farm amounted to ₱9,567.55. By this arrangement the farm will be under the control of the provincial secretary, and Mr. C. R. Morales, who has been in charge of it since last May, will be in immediate control of the work as superintendent or assistant to the provincial secretary.

LAKE LANAO COFFEE.

This office is in receipt of the following information, dated January 31, from the president and secretary of the municipality of Malabang in the Moro Province. The higher lands close to Lake Lanao are particularly suited to planting coffee. The Moros have a good crop of coffee about every two years. In 1906 there was ₱125,000 worth of coffee sold in Malabang, most of which was bought by the local Chinese merchants. The coffee in the Lanao country is not cultivated, but grows wild. The Moros do not even clean the ground around it. During the past two years there has been a considerable decrease in the number of coffee plants, as many of them have died off on account of old age and from lack of proper care. The coffee, however, is of superior grade and would give splendid returns on an intelligent investment. The following figures showing the shipments of Lanao coffee from this place for the past three years are approximately correct:

	Kilos.
1907, amount of coffee exported	13,643
1908, amount of coffee exported	3,324
1909, amount of coffee exported	29,795
Total	46,763

These figures do not include the total amount brought to Malabang, as a considerable part of this amount is sold or exchanged locally for other products. The price obtained by the Malabang merchants for the caracolillo bean is from ₱1 to ₱1.10 a kilo. This bean is the pick of the coffee from the Lanao coffee district and amounts to perhaps one fifteenth of the total output.

LIBERIAN COFFEE IN BASILAN.

Dr. J. W. Strong, of Zamboanga, speaking of his experience with Liberian coffee, in the Mindanao Herald of March 5, states that in different tropical countries Liberian coffee has done well where *Coffea arabica* has been destroyed by the coffee leaf disease (*Hemileia vastatrix*). He believes that Liberian coffee is much better adapted to strictly tropical conditions than Arabian coffee, as the former is almost entirely free from the leaf disease above mentioned. While Liberian coffee brings a lower price on the world's market than the Arabian, its freedom from disease makes it well worth considering by prospective coffee growers. Liberian coffee is propagated from seed which should be fresh and in parchment. From fresh seed, say only a week or two old, at least 90 per cent should germinate. In making the nursery the ground should be dug or plowed at least a foot deep and all sticks and stones removed, so that the surface of the soil can be put in good condition. The seed should be planted in drills or broadcast on the surface and then covered with not more than one-half inch of earth. A light shade should be provided that will exclude most of the sun, but admit rain, and during the dry season the nursery should be watered at least every second day. It is about forty-five days before the seed leaves appear, and the young plants should be at least three months older before they are transplanted. After the young plants have a good start the shade can be removed little by little until all has been removed at least two or three weeks before transplanting. The coffee when ready for transplanting can be set out from 2 to 3 meters each way, according to whether it is to be grown alone or as an intercrop with Para rubber. If planted with Para rubber it should be planted 3 by 3 and the rubber trees 6 by 6 meters. The young trees should be shaded for a few days after transplanting. Care should be taken not to injure the tap root, which will be found very long even in quite young plants, and the hole in the ground should be dug deep enough to permit its being planted straight and not doubled or broken off. The first flowering can be expected about thirty months from planting, and there will be succeeding bursts about every two months. There will be some ripe fruit almost all of the time, but the heaviest crops will appear in July and January. The berries should be picked by hand and can be treated as ordinary coffee, either by hand or machinery. With young trees, say three or four years old, from 4 to 7 kilos of dry coffee should be obtained from each 45 kilos of ripe berries. The berries hang on the tree until quite dry, so there is little or no loss from their falling off if they are not plucked immediately

after they ripen. Liberian coffee trees require less pruning than the Arabian, but care should be taken to cut out the suckers or water sprouts. The yield per hectare will, of course, depend upon the number of trees, but from one-half to 1 kilo of dry coffee per tree can be depended on from trees four and five years old. This amount will increase to as much as 1 kilo or more as the trees grow older.

MISAMIS COFFEE.

According to Mr. C. Paredes, of Oroquieta, Misamis Province is forging to the front, and there is a great movement toward developing the resources of that section of the country. Mr. Paredes also states that Mr. Steven, who has been enlisting Filipino laborers for Hawaii, has recently acquired a tract of 1,000 hectares of land along the sea between Misamis and Oroquieta, where he intends to start a large coconut plantation. Business seems to be picking up all along the north coast of Mindanao, and the exports of copra are increasing each year. Some very fine coffee is raised in the foothills of the mountains. The coffee industry is becoming one of the chief industries of the province, and within a few years it is believed that this product will form the principal article of export from that part of Mindanao. Last year 500 piculs were sent out, and this year it is estimated that three times as much will be exported. Thus far the Misamis coffee trees have not been molested by destructive insects like those which have killed many coffee trees in the northern provinces. Back from the mountain ranges the country is very much the same as along the coast—one rolling plain, on which are many Montesco and Mañobo rancherias. According to those who have visited this section it rivals the climate and soil found in Davao and the southern part of the island.

PEANUT GROWING IN MALABANG.

Experiments have been made at different times in growing peanuts at this place, where they seem to do particularly well. They have been raised in considerable quantities, and the quality of those grown in each case has been pronounced excellent. The vines are very luxuriant, and the principal farmers here report that carabaos and horses thrive on the green tops, and that horses greedily eat even the dry vines and keep in excellent condition thereon. The soil is easily worked and produces a large white nut. The principal drawback which has been encountered thus far with peanut cultivation in this locality is the necessity for strong, tight wire fences to keep out wild hogs, which abound in the vicinity.

THE AGRICULTURAL SCHOOL BUILDING IN BACOLOD.

The agricultural school building at Bacolod has been completed by the contractors, Messrs. Lambert & Co., and inspected by the district engineer for its final acceptance by the province. The construction of this building, which cost only a little more than ₱10,000, is one of the most needed and most commendable enterprises on the part of the provincial authorities in Occidental Negros. Bacolod is in the heart of one of the richest farming sections in the Philippines, and it is therefore highly desirable that the school authorities give special attention to training and education along agricultural lines. The work carried on in the new agricultural school building should be one of the most prominent features of the educational work in the provinces.

SUGAR-CANE PLANTING IN ANTIQUE.

The exceptionally high price of sugar during the past two months has given a great stimulus to sugar growing in the Province of Antique which heretofore has produced only a comparatively small amount of sugar. While the plantings are not so extensive as in other sections of the Island of Panay, the present activity on the part of the farmers indicates that they are awake to the opportunity now offered by the American markets. The principal sugar districts of this province are in the towns of Barbaza, Bugason, Culasi, Pandan, Patnogon, San Remigio, and Tibiao.

MORE TOBACCO BOUNTIES.

Under date of January 15 of this year, the Governor-General issued Executive Orders Nos. 7, 8, and 9, providing for tobacco bounties in the Provinces of Capiz, Occidental Negros, and Ilocos Norte. One thousand pesos per annum is provided for each of the provinces named, which shall be expended for bounties for encouraging the tobacco-growing industry under the rules and regulations made by the Director of Agriculture, with the approval of the Secretary of the Interior. In distributing this money it is to be divided into two parts. The first is to be divided into three prizes—one each of 50, 30, and 20 per cent of the amount. These prizes are for the leaf tobacco to the planters who plant not less than one-half hectare nor more than 10 hectares and produce the largest marketable leaves of tobacco per hectare. The second part of the prize is to be divided into three awards—of 50, 30, and 20 per cent—to the growers who cultivate not less than one-half hectare

nor more than 10 hectares and who sort the tobacco and harvest it in the most unform manner as regards the size, quality, coloring etc., of the leaves. Growers of leaf tobacco desiring to compete for the prizes must register as competitors with the provincial treasurer of their province at the time of planting or as soon thereafter as possible.

A NEW PLANTATION COMPANY IN NEGROS.

The Polo Plantation Company has been formed in Oriental Negros with a capital of ₱60,000 to start a coconut plantation. The company has acquired about 1,000 hectares of land between Amblan Point and Tanjay, and the work of preparing the land for planting has already been begun. Mr. Henry Fleischer is the managing director of the new company, and in a short time he expects to leave for the United States by the way of Europe, stopping in Ceylon to study the methods of cultivation and the preparation of copra for market in that country. Mr. Fleischer has a tract of land of his own near the new hacienda, upon which there are now growing 21,000 trees, some of which are already bearing fruit.

THE AGRICULTURISTS OF CEBU.

On the 20th of February Governor Jakosalem called a meeting of the agriculturists in the Island of Cebu, the object of which was to organize an agricultural association for the protection and improvement of agriculture in that region. At the opening session, before a large gathering, Governor Jakosalem explained in a few words the object of the meeting, after which there were speeches by Sr. Florentino Rallos, vice-president of the Insular Agricultural Association for the Province of Cebu, and Assemblyman Filemon Sotto. The farmers' assembly unanimously approved the plan presented by the provincial governor, and after some discussion elected the following officers:

President.—Florentino Rallos.
Vice-president.—Florencio Noel.
Treasurer.—Pedro Cuí.
Directors.—Leoncio Alburo, Marcial Velez, Lazaro Osmeña, Cresencio Velez, and Mariano Tevez.

This movement on the part of the agriculturists of Cebu is decidedly commendable, and if rightly carried on and supported will result in great good to the whole island. The members of the Cebu Agricultural Association, while they should first look for the protection of the agricultural interests in their section,

should also give their support and coöperation to every movement which tends to promote the best interest of the community at large as well as of the farmers.

FARM MOVEMENT IN NUEVA CACERES.

According to La Paz, of Nueva Caceres, many clearings have been made along the banks of the Bicol River and some houses and many "casetas" are being erected. The "kaingin" clearings are being abandoned, and permanent crops, such as coconuts, are being planted. A considerable portion of the country, which for some time has been covered with cogon, is now being cleared, and the fields are dotted here and there by farm homes, and many houses are surrounded by cultivated fields, which have been planted with corn, rice, camotes, coconuts, etc. A similar revival of farming has been noted along the Caceres and Iriga Road. According to this paper there are many signs of improvement in which La Paz takes just pride as the result of its campaign for more and better crops, for industrial and agricultural improvements.

AN AGRICULTURAL ASSOCIATION IN BATAAN.

On February 20 the provincial governor, Sr. Mariano Rosauro, called a convention at Balanga of the agriculturists of the Province of Bataan. The convention first listened to the reports of the delegates Sres. Antonio Yazon and Apolonio Mendoza, who represented Bataan Province at the Agricultural Conferences which were held in Manila during the Carnival. Mr. Yazon, who had been elected vice-president of the Insular Agricultural Association from the Province of Bataan, reported on the addresses of the Governor-General and the members of the Commission, also on the various papers and discussions which were carried on during the conferences in Manila, after which Mr. Mendoza gave a report on the trips made by the delegates to the forage factory, the buildings of the College of Veterinary Science at the quarantine station at Pandacan, to the sugar factory of the Luzon Sugar Refining Company, Limited, at Navotas, also to the serum laboratory and the stock farm at Alabang. Following the report of the delegates, Governor Rosauro made a few remarks, expressing his thanks to these gentlemen for their enthusiastic interest in the agriculture of the province as well as for the sacrifice of their time and money in order to attend the conferences in Manila and give the farmers of Bataan Province the benefit of them through such reports. After the remarks by the governor, it was unanimously voted that

a provincial agricultural association be formed for Bataan Province, and the following officers were elected:

President.—Sr. Antonio Yazon.

Directors.—Sres. Apolonio Mendoza, of Balanga; Agustin Paguio, of Pilar; Estanislao Rivera, of Orion; Lorenzo de la Fuente, of Abucay; Roque Consunji, of Samal; Isaac Tangco, of Orani; Mariano Nugued, of Hermosa; Arcadio Jocson, of Dinalupihan; Julian Sareal, of Mariveles; Ildefonso Batol, of Bagac; and Julian Leaño, of Morong.

THE VETERINARY COLLEGE.

The Manila quarantine station occupies a tract of about 15 hectares opposite Nagtajan in Pandacan. Besides the forage factory and the quarantine sheds there are three new buildings to be used for the College of Veterinary Science of the University of the Philippines. These buildings include a lecture hall and laboratory, about 8 by 11 meters, with an attractive porch, all of reinforced concrete. Near by is an operating building about 8 meters square, the larger part of the walls of which are a framework covered with fine wire screen which allows plenty of ventilation. Connected with these buildings is a septic vault, into which will be carried all of the refuse from the laboratory in connection with the lecture room and from the operating building. A short distance to the left of these buildings is a well-ventilated hospital for diseased animals. This building includes an office for the doctor in charge. The hospital is also supplied with a septic vault about 3 by 7 meters, to which all refuse will be carried, so that there will be no danger whatever from contagion to animals kept at other parts of the station. All of these buildings are one-story concrete structures with tile roofs. The grade of the quarantine site is now being filled in to the required level. A bridge has been placed across the estero near the Pandacan church, and a street is being built to the site of the College of Veterinary Science. These new buildings have been specially constructed for this college, designed specially for its classes, and every facility will be afforded for adequate instruction. The college is expected to open in June, the course will be for four years, and upon its completion the degree of doctor of veterinary science will be conferred.

A REFORM IN THE LAND SYSTEM.

At a meeting of the provincial governors held during the first week of February, the Executive Secretary, Mr. Frank W. Carpenter, acting as direct representative of the Governor-General, announced to the provincial governors a complete change in the Government plan for giving titles to lands. The Executive

Secretary stated that we have millions of acres of agricultural lands uncultivated and a large portion of this land is occupied by people who have no perfected title. According to the assessment of 1906 there were 2,795,215 parcels of land declared. Practically all of these declarations were by private parties who claim to be the owners of the same. Up to the present time, or since the organization of the land court in 1903, less than 5,000 titles have been given. At this rate it would take over three thousand years to register all of these holdings, so it is absolutely necessary that some means be provided for expediting this work. In order to do this the Government has decided to make a systematic survey and register all parcels of land within certain districts or municipalities, and will be prepared to present to the legislature at its meeting in October proposed legislation for the proper carrying into effect of the new system of giving titles to lands.

One of the prominent features of this reform of the land system is that the Government will not, except where it is necessary, oppose the giving of titles to land. For example, in cases of the provinces and municipalities occupying lots and lands for governmental purposes it has been decided by the Governor-General that under authority conferred upon him by the provision of Act No. 1890 these lots and parcels of land will be transferred or conveyed to such provinces or municipalities free of charge, giving all title and interest in the same of the Insular Government, subject only to the provision that the provinces or municipalities will use such lots or lands for governmental purposes. It is believed that this action will adequately meet all the needs of the municipalities and the provinces.

In regard to the survey and title to land claimed by private parties above mentioned, it is hoped that the Legislature at its meeting in October will provide laws adequate to meet the needs of the masses of the people who are undoubtedly owners of lands, but have no perfected titles showing their ownership. Under this heading it might be stated that it is the idea of the present Executive that such laws should provide the necessary money to carry on surveys on a large scale, authorizing the Government to pay in the first place all of the expenses incident to the perfecting of titles, including the cost of the surveys and the approval of the plans as well as their publication, but not including the private expenses of litigants and lawyers. On the issuing of titles to owners, such owners will then enter into a contract with the Government to refund in a specified number of years 70 per

cent of the actual cost incident to the perfecting of their titles, the remaining 30 per cent to be paid by the Insular Government, the province, and municipality in equal proportions. In this manner any owner of land could obtain a title to his holding without any cost to him in the beginning, and he will refund to the Insular Government, without any interest, the money covering his share of the actual expenses incurred in making the survey and securing the title through the provincial treasurer in the same manner as land taxes are now collected. In this way each owner will have to pay only a small amount annually, as the cost of registration will be materially reduced by surveying and registering a large number of parcels practically at the same time, which will be a great saving to the Government as well as to the landowner.

This plan when perfected will be one of the greatest steps taken by the Government to provide for and assist in the agricultural development of the country, as with satisfactory titles to their lands our farmers will find no difficulty in borrowing reasonable sums of money from the Agricultural Bank, which since its establishment has been little more than a bank in name on this very account. In conclusion, Mr. Carpenter stated that it is thought to be better both for the people and the Government to grant titles to the holders and possessors in good faith of agricultural lands than to have the Government continue to oppose this class of cases, as it is a well-settled fact that a man with a perfected title to his holding makes a much better citizen, anxious to obey and assist in the enforcement of the laws, who will freely contribute his part of the burden necessary to carrying on the Government.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS FEBRUARY, 1910.

By the COLLECTOR OF CUSTOMS.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Total.
Rice	Quantity	Kilos	6,608,300	4,814,609	1,855,434	92,204	101,496			3,472,043
	Value	Dollars	182,451	129,827	45,724	3,245	3,395			364,642
Beef cattle	Quantity	Numbers	2,136	61	483		9			2,689
	Value	Dollars	46,075	1,446	6,955		629			55,105
Hogs	Quantity	Numbers								
	Value	Dollars								
Sugar	Quantity	Kilos	252,538	24,251	2,395	5,238	7,871			292,293
	Value	Dollars	17,135	1,622	167	386	551			19,861
Coffee	Quantity	Kilos	56,040	778	1,647	108	1,879			60,452
	Value	Dollars	12,638	319	325	32	502			13,816
Cacao	Quantity	Kilos	66,294	2,600	2,540					71,434
	Value	Dollars	15,916	634	649					17,199
Eggs	Quantity	Kilos	252,796	187	139		503			253,625
	Value	Dollars	24,979	8	8		21			25,016
Raw cotton	Quantity	Kilos								
	Value	Dollars								

EXPORTS.

Hemp	Quantity	Kilos	3,093,100	1,821,975						4,915,075
	Value	Dollars	314,845	198,400						513,245
Sugar	Quantity	Kilos	252,075		2,296,339	1,116				2,549,530
	Value	Dollars	12,005		135,253	65				147,323
Copra	Quantity	Kilos	4,113,460	1,433,351		127,631	220,360			5,894,742
	Value	Dollars	402,200	123,050		10,938	18,056			554,244
Cigars	Quantity	Thousands	16,709							16,709
	Value	Dollars	295,615							295,615
Cigarettes	Quantity	Thousands	2,878							2,878
	Value	Dollars	3,361							3,361
All other tobacco	Quantity	Kilos	506,510			95				506,605
	Value	Dollars	88,766			1				88,767

THE ILOILO SUGAR MARKET.

By José T. Figueras.

FEBRUARY.

The arrivals of sugar in Iloilo from the fields and sugar mills during the month of February amounted to 220,360 piculs. Most of these were in large quantities and consisted of firsts and seconds.

The sugar market for January closed at 7 pesos and 4 reales, which continued until the 3d of February, when it went up to 7 pesos and 5 reales, at which price it continued steady until the 10th, when it went up to 7 pesos and 6 reales; on the 16th the price went to 8 pesos; on the 19th it rose to 8 pesos and 1 real, on the 23d to 8 pesos and 2 reales, on the 25th to 8 pesos and 2½ reales, and on the 28th, the last day of February, to 8 pesos and 4 reales.

February shipments.

CROP 1909–10.

Date.	Vessel.	Destination.	Superior. (piculs.)
February 16	Hunan	Ningpo	9,697
Do	do	Shanghai	8,926
February 19	Sungkian	Hongkong	1,230
Total for February			19,853

Exports up to February 26 for 1908 and 1909.

[In piculs.]

To—	1908–09 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States			18,400	
Japan	8,000	5,915		
China	319,739		64,575	
Total	327,739	5,915	82,975	

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

FEBRUARY, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tárlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	23.5	37.2	24.4	52.3	24.6	3.8	26.4	------	22.4	------	24.0	------
2	24.0	9.2	24.4	42.1	23.3	18.7	26.0	------	21.9	------	24.2	------
3	23.7	15.7	24.4	27.2	24.2	11.7	25.4	------	21.9	------	23.1	------
4	25.3	0.8	24.8	9.4	25.8	------	26.1	------	22.2	5.0	23.8	------
5	25.2	44.9	25.0	13.2	26.2	------	26.6	------	21.4	3.4	24.2	------
6	25.6	8.1	25.9	7.4	26.7	------	27.2	------	23.1	------	24.8	------
7	26.4	39.2	25.6	6.1	26.8	------	27.0	------	23.9	------	26.0	------
8	26.6	10.7	25.8	7.9	27.3	------	26.8	------	24.1	1.4	25.9	------
9	26.7	9.5	25.4	18.8	27.6	------	28.3	------	23.4	------	26.0	------
10	27.0	7.6	26.0	2.6	26.8	6.9	27.0	1.0	23.3	------	25.8	------
11	26.8	7.9	26.4	------	26.5	------	26.6	------	22.5	------	25.7	30.5
12	24.0	106.6	24.6	18.3	26.4	------	27.0	------	21.6	4.8	25.4	------
13	24.1	17.9	25.4	5.1	26.8	------	25.8	------	22.2	0.8	26.2	------
14	26.0	2.8	25.8	4.4	26.7	1.3	27.2	------	22.8	0.3	26.2	------
15	26.7	5.0	26.4	0.8	26.2	------	28.4	------	24.1	------	26.9	------
16	26.8	4.6	26.3	3.3	27.0	------	28.5	------	25.0	------	26.6	------
17	27.0	------	27.0	2.5	27.2	------	30.2	------	24.9	------	25.8	------
18	27.0	------	26.8	------	27.3	0.8	30.0	------	25.0	------	25.3	------
19	24.6	39.7	25.3	7.7	26.9	2.0	28.2	------	24.3	------	26.7	------
20	26.2	2.3	25.2	23.4	25.8	------	27.7	------	23.9	------	26.6	------
21	26.2	------	26.0	------	26.5	------	26.6	------	25.3	------	25.8	------
22	26.2	------	25.9	------	25.6	------	26.7	------	24.9	------	27.0	------
23	25.4	------	25.9	------	25.6	------	27.0	------	24.9	2.8	24.6	------
24	26.4	------	25.4	0.5	26.0	------	27.1	------	24.2	1.3	25.7	------
25	27.1	------	25.8	0.5	25.9	------	26.3	------	26.2	------	26.1	------
26	26.2	13.9	26.9	------	25.8	------	26.0	------	24.6	------	24.7	------
27	27.1	------	26.2	1.3	26.6	0.5	27.6	------	24.4	------	26.7	------
28	27.1	------	25.9	------	26.2	------	28.1	------	25.8	------	26.2	------

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of rice, abacá, copra, sugar, tobacco, and corn for the month of November, 1909.

[NOTE. 75 liters = 1 cavan; 63.25 kilos = 1 picul; 46 kilos = 1 quintal.]

Provinces.	Unhulled rice, per 75 liters.		Abacá, per 63.25 kilos.		Copra, per 63.25 kilos.		Sugar, per 63.25 kilos.		Tobacco, per 46 kilos.		Corn, per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱2.00	₱1.50	₱8.25	₱7.25	₱8.75	₱8.75					₱3.00	₱1.00
Albay	3.50	2.50	12.00	7.56	12.00	5.00					4.00	1.25
Ambos Camarines	3.75	1.50	12.00	5.50	8.00	5.00	₱8.00	₱5.00			4.00	2.00
Antique	2.50	1.00	18.00	10.00			5.05	3.00	₱25.00	₱15.00	3.00	1.25
Bataan	3.15	2.50					9.00	5.50			2.50	2.00
Batangas	4.00	2.40	12.00	8.00			9.00	3.50	9.00	9.00	4.00	1.80
Bohol	3.75	1.50	11.38	7.60	9.50	6.00	8.75	4.20	25.00	4.00	4.00	1.50
Bulacan	3.00	2.40					8.50	6.00	20.00	12.00	3.00	1.00
Cagayan	4.00	2.50							17.00	10.00	3.50	2.00
Capiz	3.75	1.50	15.00	8.00	10.00	5.50	6.80	4.50	20.00	4.00	3.00	1.00
Cavite	3.25	2.80	11.00	11.00			6.00	3.25	16.00	16.00	3.00	2.30
Cebu	3.75	2.50	15.00	8.00	10.00	6.00	8.00	3.00	30.00	5.00	4.75	2.50
Ilocos Norte	3.00	2.00					6.00	5.00	20.00	5.00	3.00	1.00
Ilocos Sur	3.75	2.00			10.00	5.00	8.00	5.00	25.00	6.00	4.00	1.50
Iloilo	3.12	1.25	15.00	12.00	9.15	6.00	7.50	4.50	26.00	5.50	3.00	1.25
Isabela	5.00	5.00							21.00	7.20	4.50	4.50
La Laguna	3.12	2.40	12.00	7.00	8.00	7.00	6.50	4.00			5.00	3.00
La Union	3.85	1.00			7.00	6.00	4.00	3.00	8.00	5.38	4.00	3.00
Leyte	3.50	2.50	13.00	8.70	8.75	5.00	9.00	4.50	40.00	15.00	3.50	2.50
Mindoro	3.50	2.25	14.00	10.00	5.00	5.00			7.00	7.00	3.75	1.50
Misamis	4.25	2.00	10.50	8.90	8.75	8.50	4.50	4.50	25.00	25.00	4.50	2.00
Moro	3.00	1.50	14.00	8.25	9.00	6.00	6.00	4.12			2.50	1.75
Mountain	8.00	3.00			9.00	5.00	5.00	3.00	25.00	4.00	6.25	2.50
Nueva Ecija	2.75	1.25					7.50	4.00	20.00	7.00	3.20	1.70
Nueva Vizcaya	3.12	2.50							20.00	17.00	3.12	1.50
Occidental Negros	3.25	1.50	12.00	8.00	9.30	6.00	6.37	4.00	30.00	8.00	3.00	2.00
Oriental Negros	4.00	2.50	15.00	8.00	10.00	6.50	5.50	5.00	20.00	5.00	5.00	2.00
Palawan	3.00	1.00	18.00	12.00	6.00	5.50			25.00	25.00		
Pampanga	3.00	2.25					8.00	5.00			3.75	2.50
Pangasinan	4.00	1.20			8.00	5.00	8.00	4.00	40.00	6.00	4.00	1.50
Rizal	3.12	2.00	18.00	18.00			9.00	4.00			3.00	2.50
Samar	4.00	2.00	13.50	8.00	8.00	5.00	8.00	4.50	18.00	8.00	4.00	2.00
Sorsogon	3.00	2.50	13.75	8.00	9.00	4.50	8.25	7.00	15.00	8.00	3.00	1.75
Surigao	2.50	2.40	11.25	11.00	10.50	8.50			30.00	20.00	2.00	1.00
Tarlac	2.50	1.50					7.00	4.00	20.00	9.00	3.75	1.75
Tayabas	4.00	2.00	13.00	6.00	7.50	4.50	8.00	4.50	20.00	6.00	3.50	2.50
Zambales	3.25	1.50			7.50	6.00	7.00	4.00	12.00	8.00	3.50	2.00

PERIODICALS IN THE LIBRARY OF THE BUREAU OF AGRICULTURE.

Everyone interested in the study of tropical agriculture is invited to visit the library and make use of these periodicals.

ENGLISH.

GENERAL.

Agricultural Bulletin of the Straits and Federated Malay States, Singapore.
The Queensland Agricultural Journal, Brisbane, Australia.
The Agricultural Gazette, Sydney, New South Wales.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of Western Australia, Perth.
Journal of the College of Agriculture, Tokyo, Japan.
Hawaiian Forester and Agriculturist, Honolulu, Territory of Hawaii.
Tropical Agriculturist, Colombo, Ceylon.
The Agricultural Journal of India, Calcutta.
Memoirs of the Department of Agriculture, Calcutta, India.
Natal Agricultural Journal, Pietermaritzburg, Natal, South Africa.
Agricultural News, Bridgetown, Barbados.
West Indian Bulletin, Bridgetown, Barbados.
The West Indian Committee Circular, London.
The British Trade Journal, London.
Bulletin of Agricultural Statistics, Rome, Italy.
Porto Rico Horticultural News, San Juan.
The Cuba Review, New York.
Bulletin of the Department of Agriculture, Kingston, Jamaica.
Journal of the Jamaica Agricultural Society, Kingston.
Bulletin of Agricultural Information, Trinidad.
Journal of the Board of Agriculture of British Guiana, Georgetown.
California Cultivator, Los Angeles, California.
The Rural Californian, Los Angeles, California.
Southern Cultivator, Atlanta, Georgia.
Progressive Farmer, Raleigh, North Carolina.
Oklahoma Farm Journal, Oklahoma City.
Farmer's Guide, Huntington, Indiana.
Kansas Farmer, Topeka, Kansas.
Hoard's Dairyman, Fort Atkinson, Wisconsin.
Farm Press, Chicago, Illinois.
The American Florist, Chicago and New York.

The Feather, Washington, D. C.
The American Thresherman, Madison, Wisconsin.
Oregon Agriculturist, Portland, Oregon.
Journal of Agriculture and Horticulture, Montreal, Canada.
The Gardeners' Chronicle, London.
Commercial America, Philadelphia, Pennsylvania.
Tropical Life, London, England.
Horn and Hoof, Seattle, Washington.
The Breeders' Gazette, Chicago, Illinois.
The Journal of Tropical Veterinary Science, Calcutta, India.
American Veterinary Review, New York.

REPORTS AND QUOTATIONS.

Crop Reporter, by the Secretary of Agriculture, Washington, D. C.
Monthly Consular and Trade Reports, Washington, D. C.
Federal Reporter, New York, N. Y.
Smith and Schipper's Monthly Report, New York, N. Y.
Hanson and Orth, Hemp Brokers, Monthly Statement, New York.
Hemp Market Report, Landauer & Co., London.
Ide and Christie's Monthly Circular, London.
Exporters and Importers Journal, Chicago, Illinois.
Quarterly Summary of Commerce of the Philippine Islands, Washington, D. C.
Ker & Co's. Price Current, Manila, Iloilo, and Cebu, P. I.
Weekly Shipping Circular (Sugar), Jose T. Figueras, Iloilo, P. I.

LOCAL.

Official Gazette, Manila, P. I.
Philippine Education, Manila.
Philippine Resources, Manila.
Far Eastern Review, Manila.
Philippine Journal of Science, Manila.
Weather Bureau Bulletins, Manila.
The Philippine Agricultural Review, Manila.

SPANISH.

Boletin de la Cámara de Comercio Filipina, Manila, P. I.
Revista Agrícola é Industrial, Manila.
Boletin Oficial de la Secretaría de Agricultura, Comercio y Trabajo, Cuba.
Boletin de Agricultura, San José, Costa Rica.
El Hacendado Mexicano, Mexico, Mexico.
El Monitor Financiero, Mexico City.
La Hacienda, Buffalo, New York.
Industrias Americanas, New York, N. Y.
Revista del Ministerio de Obras Públicas, Bogotá, Colombia.
El Agricultor Peruano, Lima, Peru.
Revista de la Asociación Rural del Uruguay, Montevideo.
Prácticas Modernas é Industrias Rurales, La Coruña, Spain.
Resumen de Agricultura, Barcelona, Spain.

OTHER LANGUAGES.

Bulletin de la Chambre de Commerce de Saigon, Saigon, Indo-China.
Bulletin Economique, Hanoi-Haiphong, Indo-China.
Chambre d'Agriculture du Tonkin, Hanoi-Haiphong.
Bulletin de Département de l'Agriculture aux Indes Neerlandaises, Java.
L'Agronomie Tropicale, Brussels, Belgium.
Boletim de Agricultura, Sao Paolo, Brazil.
Tamil Journal of South Indian Agriculture, Madras, India.
Station Agronomique, Port Louis, Colony of Mauritius.
Journal d'Agriculture Tropicale, Paris.
Boletim do Museu Goeldi, Para, Brazil.
O Fazendeiro, Sao Paolo, Brazil.
Boletim de Sociedade de Geographia de Lisboa, Portugal.
O Criador Paulista, Sao Paolo.
Bulletin Agricole, Port Louis, Mauritius.
Memorias do Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

THE PUBLICATIONS OF THE BUREAU OF AGRICULTURE.

The following-named bulletins of the Bureau of Agriculture are available for distribution, and will be sent free of charge to any address upon application. Applicants are requested to state whether all publications of the Bureau are desired as issued, or only those specified. The name and address of the applicant should be plainly written and all communications should be addressed to the Director of Agriculture, Manila, Philippine Islands.

FARMERS' BULLETINS.

No. 4. Preliminary Report on Commercial Fibers of the Philippines. (Spanish.)
No. 6. Experimental Work with Fungous Diseases of Grasshoppers. (Spanish.)
No. 9. A few Suggestions on the Cultivation of Cotton. (Spanish.)
No. 11. The Jute Industry. (Spanish.)
No. 12. Abacá. (Manila Hemp.) (English.)
No. 13. The Cultivation of Maguey in the Philippine Islands. (English and Spanish.)
No. 14. The Cultivation of Sesamum in the Philippine Islands. (Spanish.)
No. 15. Tobacco Growing in the Philippines. (Spanish.)

PRESS BULLETINS.

No. 6. The Tamarind. (English.)
No. 8. Maguey; Propagating Abacá from Seed; etc. (English.)
No. 9. Agricultural Districts; Control of Rinderpest; etc. (English.)
No. 11. Seed Distribution; Need of Diversified Farming; etc. (English and Spanish.)

POPULAR BULLETINS.

No. 1. Maguey. (English, Spanish, Visayan, Cebuano.)
No. 2. Kapok. (English, Spanish, Tagalog, Visayan, Ilocano, Cebuano.)

THE PHILIPPINE

Agricultural Review

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EDITORIAL.

THE TRANSFER OF THE BUREAU OF AGRICULTURE.

On April 11 the Philippine Legislature passed Act No. 1972, transferring the Bureau of Agriculture from the Department of the Interior to the Department of Public Instruction. According to the provisions of this Act the Department of the Interior will hereafter include the Bureau of Health, the Bureau of Lands, the Bureau of Science, the Bureau of Forestry, the Bureau of Quarantine Service, and the Weather Bureau; and the Department of Public Instruction will include the Bureau of Education, the Bureau of Agriculture, the Bureau of Supply, the Bureau of Prisons, and the Bureau of Printing.

We do not understand that this transfer will in any way affect the work of the Bureau of Agriculture, except to place it in closer connection with the educational work of the Islands.

INCREASED INTEREST IN SUGAR PRODUCTION.

The increased interest in growing sugar cane since the passage of the Payne Tariff Bill has far exceeded the expectations of the most sanguine. The price of sugar has steadily climbed from about ₱5 per picul (63¼ kilograms) for No. 1, at the beginning of the harvest season, to more than ₱9 in the early part of April. A slight decline in prices followed, and at the end of last month No. 1 was steady at ₱8.25. These prices have given the people who are growing sugar cane an increase of from 60 to 80 per cent over the amount which they would ordinarily have realized from their sugar crop. In consequence there has been an increased interest in the purchase of work animals, the extension of planting, and the installation of better machinery. Interest in this crop has also been heightened by the purchase of large tracts of land by capitalists from the United States and Hawaii and the prospect that more capital will be invested here in this business in the near future.

Beginning with this number of the REVIEW we are publishing a brief account of the trip made by the Editor to Louisiana and Hawaii to investigate the sugar industry, and an article on the "Area and Cultivation of Sugar in the Philippines in 1908," by the Collector of Internal Revenue. Arrangements are being perfected for the publication in succeeding numbers of additional material on sugar growing, manufacturing, and marketing. Especial attention will be given to the question of milling, as it appears that the extension of the area devoted to sugar is out of proportion to the increase of the machinery available for taking care of the next crop. Heretofore each *hacendero* has owned and operated his own mill, but the holdings were usually too small to warrant the installation of high-class machinery which would economically handle the cane produced. One of the pressing needs of the sugar industry is the establishment of central mills to handle the entire product of a large number of small plantations. There is no sugar machinery of very small capacity which is as highly efficient in the extraction and economic evaporation of the juice as the large mills which are capable of handling the product of several average plantations in the Philippines.

NATIVE FORAGE CROP.

The question of the local production of an abundant and economic supply of satisfactory forage for both native and imported live stock was one of the earliest investigations of the Bureau of Agriculture. In this connection, we publish in this number of the REVIEW an article on corn growing by Mr. Harold Cuzner, formerly with this Bureau. One of the products which is now extensively used as a forage for live stock is native corn and corn fodder. There are a number of other local products which are highly nutritious and have everything to recommend them, except that they are not so well known as oats, timothy hay, bran, and other American feed stuffs.

Some two years ago the Bureau of Agriculture secured an appropriation for the erection of a small experimental forage factory in which it was proposed to grind, crush, mix, and otherwise prepare native grain feeds, such as corn, beans, rice polish, copra cake, etc., and to cure by artificial heat the native grasses and forage plants for the production of hay. This factory, which has been put into operation during the current year, has been quite successful in the preparation of grain feeds, but less so in the artificial curing of hay. The principal difficulty encountered is in securing such supplies at prices which would make the cost less than that of imported forage products.

WHAT WE SHOULD DO TO AID AGRICULTURE IN THE PHILIPPINES.[1]

By Hon. DEAN C. WORCESTER,
Secretary of the Interior.

It is my duty as well as my pleasure to speak to you on the subject, "What we should do to aid agriculture in the Philippines." It has not been possible for me to prepare my address in advance for the simple reason that until actually present here I could not know what classes of persons would be included in the word "we." Now I see before me His Excellency the Governor-General, the honorable the Secretary of Public Instruction, members of the Philippine Assembly, the Director of Agriculture, special delegates sent from many provinces to represent them at this agricultural conference, and governors of provinces. I see old men and young men as well as ladies both old and young. I see with great pleasure, indeed with special pleasure, young Filipina women who come from the Normal School, and let me say, in passing, that in my opinion we have in this school an institution which is doing a most important practical work for the advancement of civilization in these Islands. Any ethnologist knows that the state of civilization of any people can be determined with some accuracy by investigating the status of women among the people in question, and one proof that the civilization which exists to-day in the Philippines is far advanced is in the important part which is played by women in these Islands. A proof of what may be expected in the future is to be found in the rapid progress which has been made by these young women who have come to study where they could have the advantages offered by a modern system of instruction.

To return to my subject. Having before me leading representatives of the executive and legislative branches of the Insular Government, as well as skilled and experienced agriculturists, and the other classes of persons whom I have enumerated, it is

[1] Address delivered February 7, 1910, before the delegates to the Agricultural Conferences at the Carnival.

evident that the nature of my audience is such as to impose no limit on what I may desire to say. If I wish to discuss the necessity for the passage of laws which may be necessary, we have with us representatives of both houses of the Legislature. Should it be desirable to speak of what Government officials may accomplish administratively, we have here present just those officials who could do most for it. Should I desire to discuss practical suggestions which might originate with persons taught in the hard but excellent school of experience, where the best of all instruction is to be gained, gentlemen, we have such persons here. Should I wish to speak of the coöperation which is necessary in the provinces, we have here the executive heads of provinces, who are the very ones to give us most assistance in this matter. In other words, we have here this morning a very representative gathering of persons able to take efficient action along any line which it is possible to discuss. There can be no doubt that the agricultural interests of the Philippines are its most important interests and that agriculture is to a special and unusual degree the basis of all our wealth. Its interests ought, therefore, to be safeguarded by all persons of power and influence, and it is a source of great satisfaction to me to note that the seats here provided have proved insufficient to accomodate our audience this morning and that it has been necessary to bring in more chairs.

I have noted that the Americans who have spoken have made efforts to speak in Spanish, while all the Filipinos who have spoken up to this moment have spoken in English, and I am in doubt as to whether I ought to employ the one language or the other. I, of course, greatly prefer to use my own language, as I do not speak Spanish readily and know that I often make bad mistakes when I attempt to use it. I am almost disposed to ask for a vote in order to learn whether English or Spanish would be understood by the larger number of persons, but perhaps I speak Spanish more readily than do some of those who will follow me and shall, therefore, use this language as well as I can.

Many of you know me and are well aware that you can not expect from me an oration. I have not come here to deliver one, nor indeed am I an orator. I have come in order to make, if possible, some very simple and practical suggestions as to what some of my hearers might do to aid agriculture. I suppose there will not be lacking persons disposed to make suggestions as to what *I* might do to the same end, and we ought to speak with entire frankness in order that we may have a free and profitable interchange of ideas.

It has been my privilege to be present in certain agricultural congresses in the Philippines, and I have noted, with regret, that often discussion has been almost entirely limited to the question of laws the passage of which by the legislative body should be requested in order that the agriculturists of this country might be made rich. Gentlemen, let me assure you that it is not possible to make the agriculture of any country prosperous by merely enacting good laws. A very good law may fail of its object as the result of bad administration, which proves that we can not obtain the end which we all desire merely by securing the enactment of good laws.

I do not mean to say that suitable laws are not both important and necessary. Indeed, we already have some important and most excellent laws favoring agriculture. Take, for instance, the matter of irrigation. There is no richer or more fertile soil in the world than that of the Philippines. We have here a hot sun which stimulates growth and we have water, but, unfortunately, sometimes there is an abundance or even a superabundance of it while at other times there is a lack. It only remains to distribute this water as uniformly as may be throughout the year, and when this is done there will be no country more favored as to its agricultural possibilities than the Philippines. To secure the proper distribution of our water, we must establish extensive and costly irrigation systems. We have already appropriated large sums for irrigation, while an excellent law concerning the subject has been passed. Actual construction work has begun, and with intelligent coöperation between the Government and the people, the day is not far distant when we shall be able to count with certainty on reaping two harvests where to-day, at the best, we reap one and as the result of a long-continued period of drought, may fail to reap any.

We also have laws relative to the suppression of cattle diseases, and we have money to expend for this purpose. Indeed, we have more than the Legislature gave, because the Governor-General, understanding the fundamental necessity of taking energetic measures in this matter, has employed his executive power to assign additional funds for this work.

The Governor-General has also interested himself in the matter of the suppression of locusts, which is another problem of enormous importance.

Finally, we have at last triumphed by securing from the Congress of the United States legislation opening the markets of that country to the products of Philippine soil with the exception of rice, and, as you well know, we need here at present all the rice which we produce, so that this exception is without

importance for us. So long as we lack sufficient rice to eat, it is manifestly impossible for us to ship rice to the United States.

Many of you have already acquired practical knowledge of the importance of this tariff victory. We all know how it has stimulated the production and the manufacture of tobacco. I believe that the owners of sugar estates must have noted that there is more activity than formerly in the sugar market, and that the new tariff law will aid in making them prosperous.

While I am far from believing that it might not be possible to enact other laws which would aid the agriculture of the country, yet I think that it is more important for us at this time to consider what we ourselves can do and what the people can do. As agriculture is the basis of wealth in this country, so good field labor may be said to be the basis of agriculture, and one of the practical pieces of work which may be performed by those of you who exercise great influence in the provinces is to better the condition of the field laborer and to improve, so far as may be, existing relations between the laborer and his employer.

We all know that the most difficult problem which confronts agriculturists to-day is that of work animals. It is not my purpose this morning to give a history of what has been done for the suppression of animal diseases, but I wish, in passing, to call your attention to the fact that there was a time when the Director of the Bureau of Science and myself were well nigh the only persons in the Philippines who believed it possible to inoculate animals successfully against rinderpest; that we were attacked not only in the public press by ignorant people who knew nothing of the advantages of the inoculation, but even by chiefs of Bureaus of the Government who were our own countrymen, and by American members of the Commission. At that time I found it necessary to fight for every peso which I obtained to continue this work. To-day you all doubtless know that effective inoculation against rinderpest is possible.

If there is here present anyone who doubts this, it would give me pleasure to take him to Alabang, show him an animal which has been permanently immunized, and offer him a thousand pesos if he can give rinderpest to this animal. He may employ whatsoever means he likes. He may place the animal on infected ground, he may draw a liter of blood from an animal sick with rinderpest and inject it into the immunized animal, yet he will fail to communicate the disease.

If the possibility of immunization against rinderpest is once admitted, the matter of the elimination of this disease then resolves itself into a question of money and good administra-

tion. You doubtless know that there are two kinds of immunity, viz, transient immunity, obtained by using serum alone, and permanent immunity, obtained by what we call simultaneous or mixed inoculation. The employment of the latter process is attended with some complications and difficulties, but the former may be employed without any difficulty and is most useful in combating epidemics. For the rest there is needed only sufficient serum and a sufficient number of properly trained veterinarians and inoculators. For some time we have been rapidly increasing the amount of serum which we produce, and the provinces are constantly calling for still more.

In the matter of securing an adequate personnel we have encountered great difficulties. I believe that I am right when I say that there does not exist in these Islands such a thing as a Filipino veterinarian. Filipino veterinarians *ought* to exist. The career is as honorable as that of a physician, and the work is of fundamental importance to this country at the present time, because the future of agriculture depends on the preservation of our work animals. I am certain that there are many young Filipinos who are entirely capable of learning to be good veterinarians. They would have enormous advantages over American veterinarians on account of their knowledge of the languages of the country and their familiarity with the peculiarities of the people, which would make it comparatively easy for them to maintain the friendliest relations with those with whom they were thrown in contact. When an American veterinarian first arrives, if he is sent at once to the provinces, he hardly knows a word of Spanish, and while he can perhaps speak English in talking with the young people, the older municipal officials do not as a rule understand this language. Therefore, we often hear that newly arrived veterinarians have made foolish mistakes which have not come from any wrong intention, but have been the direct and necessary result of their not understanding the language and the customs of the people with whom they have had to deal. Indeed, such a result is almost inevitable, for Americans are not born with a knowledge of the Philippines, nor can they obtain such knowledge in our schools and universities. In order to secure it, they must come here and learn by experience, so that it may truly be said that a veterinarian must be in the country at least a year before he learns by experience things that are necessary in order that he may develop a high degree of efficiency in his work.

As you know, we decided to establish a veterinary college as one of the branches of the Philippine University, and, indeed, we actually threw open a course of study. How many persons

do you suppose decided to enter? *One*! This condition of things ought not to continue. Every one of you ought to constitute himself a missionary to convince some young, bright, able Filipino of the advantages of educating himself so that he can coöperate with the Government in this most important work of suppressing animal diseases. You ought to call the attention of really capable persons to the fact that there exists an opportunity to obtain training for a career which will not only be honorable but will insure to those who pursue it successfully very adequate compensation. I urge you to coöperate with the Government in this matter.

There is another difficulty to be met with here, as in every country. You have received much from the Government, and I regret to say that there exists a considerable body of persons who seem to regard the Government in the light of a cow which they may milk whenever they happen to be hungry. In other words, they have formed the habit of depending on the Government for everything.

Convinced of the efficacy of inoculation against rinderpest, they are disposed to leave all the work to Government officials. They say "Come and save our cattle," but if we ask them to assist in enforcing quarantine regulations, they think it too much trouble! Remember that the people must do their share. Without their coöperation it is impossible to secure satisfactory results. We have to-day far more serum than ever before. We have perhaps a sufficient number of veterinarians. You may see in my office, or in that of the Director of Agriculture, a map on which are shown for each day the towns where rinderpest and surra prevail. If a new center of infection develops, we learn of it promptly and its position is marked on the map, thus the problem is kept constantly and graphically before us. The map shows the exact whereabouts of each veterinarian and of each inoculator, so that we know daily just where the diseases are and just where the men are who are actively combating them.

We have organized a general campaign. This we could not do in the past for lack of serum and for lack of veterinarians. We were able to attack a local epidemic here or there and to clean one province after another, but a general attack was impossible. To-day we are inaugurating a general attack, and we trust that all of you will employ your official positions, your personal influence, and your special knowledge to help us in this most important work, which can not be successful without your coöperation.

Another matter of fundamental importance is to make laborers, and especially the young people of the country, understand

the importance of working and the fact that all honest labor is honorable. In the United States this fact is well understood among the better classes. I, myself, when young, worked hard in the fields with my hands in the hot sun. I am proud to say to you that I have managed the plow, have made hay, have milked cows, and have labored as an agriculturist. One of the most famous Presidents the United States has had began his life in this way. Many of our multimillionaires take especial pride in telling everyone that they began life without a cent and have had to work hard for all that they have obtained. The conviction that labor is honorable is a good thing for the people of any country. It is not so general here as it should be.

Soon after arriving at Manila, in 1900, feeling the need of exercise, I used to work in my garden in the morning. Thirty or forty of my Filipino neighbors would often gather to witness the unusual sight. Some of them undoubtedly thought that I was crazy, while others perhaps believed that I did not have enough money to pay a gardener. At last a kind old man attempted to take away from me the hoe that I was using, saying "Permit me, sir; I will do this work for you." No one seemed to understand that I was working because I wanted to, and that for me hard, manual work was not only honorable but useful. Let us never forget that the vocation of the field laborer is not only useful but is in every way honorable.

There are certain things that the poorest residents of this country can do to better their condition. It is an easy matter to plant a tree, and after a few years the tree may become very valuable. How much is a good mango tree worth? It is the easiest possible thing to plant a mango pit, and yet how many pits do you believe are planted annually in the Philippines? Very few. Hardly anyone interests himself in planting mangoes. The coconut palm is far more important than the mango tree. It is easily planted. Most property owners in the provinces have unoccupied land that they might plant with coconuts. The trees require comparatively little care and in a few years will bring rich returns to their owner.

I have eaten bananas in many countries without finding any which equaled the better varieties produced in these Islands, yet one can hardly find a real plantation of bananas in the Philippine Islands. American capitalists go to Cuba, to Porto Rico, and to other tropical countries where they buy great estates in order to plant bananas. Lines of steamers have been established for the transportation of the fruit. The industry is an enormous one, often bringing great wealth to those who engage in it. In Manila, on the other hand, it often happens that it is almost

impossible to buy decent bananas in the public market where they might be sold in very large numbers. If the country produced them in excess of its local needs, we have close at hand the great market of Hongkong, which can be reached by regular lines of steamers. Almost anyone living near Manila could engage profitably in the business of raising bananas.

We have two kinds of papayas. You doubtless know that the papaya is a very valuable fruit. It furnishes not only nourishment but also a ferment which is an aid to digestion. The smaller of the two varieties is an insignificant fruit with a poor flavor and an odor which is disagreable to many persons. The larger variety, commonly called the "Dapitan Papaya," may grow to weigh 10 pounds or more. It has a delightful flavor and is a really superior product. A single fruit will cost you a peseta and a half in the Manila market. I have had in my garden a tree which bore sixty or seventy fruits at a time. Trees grown from seed produce fruit within a year. Why can we not bring about the general introduction of this splendid papaya, which grows readily and furnishes an abundant and healthful food supply? In order to accomplish this, it is necessary only to plant proper seed and at the same time to kill the male trees of the common, worthless variety. If this plan is followed, the owners of trees may continue to use the fruit of the common variety while the seed of the improved variety will not degenerate.

Some of the things which I have suggested have actually been done in certain parts of the country. You all know that the wealth of Romblon is due in a large measure to the order of a former governor who compelled every inhabitant to plant a certain number of coconuts each year. To-day almost the entire island is covered with coconut trees in bearing.

We can not to-day give orders of this sort because individual liberty now exists, but we may use our *influence* to bring about the same result by encouraging the planting of oranges, lemons, mangoes, chicos, and other trees and bushes which produce valuable, edible fruits. Their planting would cost little work, and from it would result in the near future an important source of food supply, and remember well, gentlemen, that there is great need of more food in this country.

Many people have accused Filipino laborers of laziness, but if they are insufficiently nourished, as they too often are, how can they work as laborers work in other countries? Look at the Scouts and the Constabulary soldiers! Place them beside young men who have not experienced the benefits of good food and vigorous exercise and you will see that they have a decidedly

superior physical development, and may well be compared in this respect with the Japanese, who have long enjoyed the reputation of being a nation of sturdy people. This is the result of good food and vigorous exercise in the case of individuals who were already well grown before they entered the service. How much more might have been accomplished had they lived properly from childhood, especially while they were growing rapidly? I insist that the majority of the laborers in the Philippines are underfed, that we should increase the food supply, and that to do this should be one of the most important aims of those who influence our policy in agricultural matters.

While we ought not to regret that we are not allowed to ship rice to the United States, we ought to regret, and be ashamed of the fact, that we are annually compelled to send large sums of money abroad to pay for the rice which we import when we have enormous uncultivated fields in this country capable of producing rice of the best quality. With the installation of irrigation works, we shall greatly increase the rice crop. We may further increase it by carefully studying the varieties of rice and learning which ones give the largest returns, which ones are best adapted to dry soil, and which give the best results under irrigation. Similar studies carried out upon rice in the United States have resulted most satisfactorily. In order to achieve like results here, we must have careful scientific investigation on one side and the general dissemination of the knowledge gained on the other. The scientific investigation is being made. Some months since I visited the Government farm at Alabang, and there saw a young Filipino dressed in shirt and pantaloons only. He was barefooted and was wading in mud up to his knees planting rice. I asked who he was and learned that he was one of the Government students who had been sent to the United States, and was then employed by the Bureau of Agriculture. I made a mental note that he must be promoted when the opportunity offered, because he was carrying out an important piece of scientific work without regard for the discomforts which it involved.

Another very important matter is to make everyone understand the importance of enriching the soil in one way or another. Heretofore, the custom has been to cultivate our enormously rich soil until it became impoverished and unproductive, and then to allow it to lie fallow until it grew rich again. Gentlemen, there is no need of letting our soil lie fallow. We may plant, first, rice and then mongos, growing two good crops and leave the soil richer than we found it, because the mongo draws the nitrogen from the air and deposits it in the soil. The same thing results from the planting of peanuts and certain varieties

of beans. Agriculturists ought to inform themselves as to the importance of the rotation of crops, so that soil may be kept productive and there may be no necessity for leaving it uncultivated. I trust that you will aid us to disseminate information on this subject.

We should do all that we can to stimulate the improvement of our work animals. The horses of the Philippines are, in many ways, extraordinary animals and could be rapidly improved by careful breeding. As yet, little has been done in this direction. With a little care, we might soon greatly improve our carabaos, our cattle, our pigs, and our poultry, and every property owner can aid in this work. We must try to convince the common people of its importance. Those of us who employ labor can contribute our share toward the general good by treating our laborers well and paying them a sufficient wage to insure them a good living. Those of us who have it within our power to legislate must occupy ourselves with the problem of avoiding the difficulties which to-day arise when laborers to whom money has been advanced desert their employers without refunding what they owe. Study was given to this problem during the last session of the Legislature, and it will again be taken up in the course of the coming regular session.

In closing, I wish to give a little emphasis to some of the things which the Governor-General has said. We are told that the country desires independence. It is not likely to gain political independence until it achieves commercial independence; until it can not only live under ordinary conditions but can bear the expense involved in preparing to defend itself. If absolute independence were conceded to the Philippines to-morrow, it could not continue, because the country to-day lacks the resources necessary to enable it to defend itself without the assistance of some other nation. Is it not better that the field laborer should be left to work in peace and should not be urged to consider whether he would, or would not, be better off if compelled to compete with Japanese laborers? If we were all politicians the country would not prosper, and we should soon starve to death. I do not mean to say that we ought not to have politicians, but politicians without bread would be in an unfortunate situation, as would agriculturists who had no politicians to look after their interests. Both are necessary; both are good in their place. The one can hardly exist without the other, and we ought to do all that we can to bring about a happy combination of the two. It would, indeed, be a calamity if all of our agricultural laborers were to become politicians or vice versa.

MINUTES OF THE AGRICULTURAL CONFERENCES HELD DURING THE PHILIPPINE CARNIVAL, FEBRUARY 7 TO 10, 1910.

FEBRUARY 7.

The entire morning session on Monday, February 7, was given over to the regular program, consisting of addresses by the Governor-General, the Secretary of the Interior, the Secretary of Public Instruction, Commissioner Rafael Palma, and the Director of Agriculture, interspersed with music and recitations furnished by the Cornell Sextet, the Philippine Glee Club, and pupils from the schools of the city. The afternoon session of Monday was given to an address by Dr. G. E. Nesom, Director of Agriculture, on "The problems of the general farmer in the Philippines" and a brief summary of the problems in connection with animal industry in the Philippines by Dr. F. C. Gearhart, acting chief veterinarian for the Bureau of Agriculture. After Doctor Nesom's address the following general discussion of the problems of Philippine farmers took place.

The first speaker was Mr. Eugenio Tiangco, of Pulilan, Bulacan. Mr. Tiangco stated that while irrigation is one of the important problems of agriculture, he believes that drainage is also a very important subject for the consideration of many Philippine farmers, because when the necessary ditches or canals have been once provided the expense of keeping them up is not equal to the amount paid for the use of water from irrigation works. In the Provinces of Bulacan, Pampanga, Nueva Ecija, and Tarlac there are thousands of hectares of low swamp lands which constitute an area larger than that of the Laguna de Bay. These lands are extremely fertile and the fields are considerably above sea level, but when an attempt is made by the farmers to cultivate them harvests are extremely uncertain.

Mr. Tiangco stated that he believes that this can be remedied by digging large ditches or canals so that in the rainy season or in time of high water or floods the excess water may flow directly into Manila Bay; for example, if such canals were made at San Luis or at San Simon, a large tract of fertile land would

be saved for cultivation. It has been estimated that the rice harvest from these tracts would amount to a million cavanes, and it is believed that the crops for two or three years would fully pay all expenses for the construction of such canals. Mr. Tiangco called the attention of the delegates from these provinces to this proposition, also the officials of the Bureau of Agriculture and the executive authorities of the Insular Government, and asked that the Insular Government set aside a sufficient sum of money to drain and reclaim these lands, which sum should be repaid in installments by the farmers benefited. He also asked that the provincial governor of each province concerned meet with the "Liga Agraria" in extra session in each town at the time of the town festival, on which occasion questions of importance to farmers should be discussed.

The next speaker to take part in the general discussion was Mr. Eulogio Reyes Carrillo, of San Pedro Macati, Rizal. Mr. Carillo, in speaking of the problems of the general farmer, called attention to the importance of the nipa industry and that *nipales* constitute one of the best sources of income of a number of farmers in the Philippines. For example, he stated that a large source of income in the towns of Malolos in Bulacan, Macabebe in Pampanga, also some towns in Pangasinan province is the "vino de nipa" factories. In this connection Mr. Carrillo also called attention to the fact that coffee, almaciga, and the mangrove industries, which he believed should be discussed during the conferences, were entirely left off from the program. He further suggested that the different delegates should at this time speak of the products of their own municipalities, in order that the subject of general farming in the Philippines might be given the time and attention in these conferences which it deserves.

Following Mr. Carrillo, Mr. Cipriano Lopez, of Balayan, Batangas, stated that one of the greatest difficulties at the present time with farmers in general, in these Islands, is the lack of money to purchase the necessary farm animals and farm machinery for cultivating their lands in a satisfactory manner. Mr. Lopez stated that he wished to ask the assistance of the Government, inasmuch as an Agricultural Bank has been established for the purpose of helping farmers, but most farmers are unable to borrow money from this bank because the Government believes that they do not have satisfactory titles to their lands. On the other hand, it will be noted that many of these farmers are enjoying undisputed possession of their lands and paying to the Government taxes upon them, as is evidenced by the fact

that in case they fail to pay their taxes the Government makes them responsible before the law and offers their lands for sale, giving tax titles to purchasers. It is believed that the Government should protect agriculture, the small landholder as well as the large one, and inasmuch as it tacitly admits that the landholder is the lawful owner, by accepting taxes from him, it should give its assistance to these landholders by provisionally admitting their lands as security at the Agricultural Bank, upon the presentation of certificates showing the payment of the land taxes. By thus admitting the lands of such farmers to provisional entry and record, and in consequence as security for loans from the Agricultural Bank, great assistance would be given to the farmers in all parts of the country.

Following the discussion by Mr. Lopez, Mr. Cirilo Bayaya, of Leyte, suggested that, in order that the matters presented by the different delegates might receive the proper consideration from the officials of the Bureau of Agriculture and the Insular Government, a committee be appointed for considering all subjects presented and formulating resolutions on such subjects as it considered of sufficient importance to be submitted to the convention, together with their recommendations for its action. This motion was seconded by Mr. Ambrosio Marasigan, of Paombong, Bulacan, and the chairman was requested to appoint a committee of three on resolutions. The following gentlemen were appointed as members of this committee.

Mr. Joaquin González, Pangasinan, *Chairman.*
Dr. Simplicio de Ocampo, Nueva Ecija.
Mr. Teodoro Sandiko, Bulaçan.

The next number on the program was "Animal Industry in the Philippines," by Dr. F. C. Gearhart, acting chief veterinarian of the Bureau of Agriculture. Owing to the short time that remained for the afternoon session, Doctor Gearhart omitted giving his paper and instead distributed copies of an outline of the matter which he wished to present to the delegates present. A few minutes were given for the delegates to read this outline, when the subject was thrown open for discussion.

The first speaker, Mr. Simplicio de Ocampo, of Cabanatuan, Nueva Ecija, asked for a statement of the symptoms which would indicate that an animal has rinderpest and what treatment should be given as soon as the character of the disease is known. In reply to this question Doctor Gearhart stated that animals infected with rinderpest should be isolated at once; that the place in which the animal was kept should be disinfected with carbolic acid, and that the owner should secure a veteri-

narian as soon as possible. He also stated that the diseased animal should be placed in the shade and bathed in order to diminish the fever, and the only feed given should be "basabasa." No medical treatment is known for the first stages of the disease, but if the animal is not seriously ill something can be done with serum.

Following this discussion, Doctor Ocampo asked regarding another disease which he had observed in his province. He stated that six of his carabaos had died, not of rinderpest but of some kind of paralysis of the hind legs. The animals were not working at the time they were taken with the disease, which lasted about one month. When asked the particular name of this disease Doctor Gearhart stated that under the conditions it would be impossible to diagnose the disease without seeing the symptoms. Doctor Ocampo further stated that there seemed to be a sort of atrophy of the limbs, that the muscles became thin and lean; in time the animal refused to eat, became unable to stand, and finally died. Doctor Gearhart stated that the disease might have been caused by improper food, that the animals might have eaten some poisonous plant. Doctor Ocampo stated that he had noted that carabaos belonging to other farmers had suffered from the same disease. Doctor Gearhart called attention to the fact that while such cases might be important, the subject of paramount importance in these Islands, at the present time, is that of *contagious diseases* which cause the loss of thousands of animals.

Following Doctor Ocampo, Mr. Carrillo, of Rizal, stated that 16 of his carabaos had died of another disease which he believed was not rinderpest. It began by inflammation of the hoofs of the animals and after the animals died blood flowed from their mouths. On being asked the name of this disease Doctor Gearhart stated that it was doubtless "foot-and-mouth disease." At this point it became necessary to conclude the session of the afternoon.

CHRONOLOGICAL REPORT ON A TRIP OF INVESTIGATION OF THE SUGAR INDUSTRY IN LOUISIANA AND THE HAWAIIAN ISLANDS.

By Dr. G. E. Nesom,

Director of Agriculture.

After landing in New York, July 27, 1909, I went for a brief visit into the hills of New England. A few days later I reached Boston, and during my stay there the Philippine tariff bill passed and was signed by the President of the United States. Realizing that this was a very important event which would have a material bearing on the future industries of the Philippines, I at once proceeded to Washington, via Fall River and New York, in the hope that I could be of some assistance to the Bureau of Insular Affairs. I arrived during the summer vacation period and found that but little interest had been shown except in the importation of cigars. I was, however, requested to return to Washington about a month later, which I did, and during that time there was considerable interest manifested in the sugar industry of the Philippine Islands. The Chief of the Bureau of Insular Affairs decided that before returning to the Philippines it was desirable for me to make a trip of investigation into sugar production in Louisiana and the Hawaiian Islands, in order that the information obtained should be readily available in the Bureau of Agriculture for those who might wish to engage in the growing and manufacture of sugar here, but more particularly for the improvement of existing plantations and milling plants. In accordance with a verbal understanding reached with the Chief of the Bureau of Insular Affairs, concerning which he cabled to the Governor-General of the Philippine Islands, I left Washington October 22 for the sugar-growing district of the Southern States.

Most of the month of November was spent in the "Georgia cane-sirup" district of South Carolina, Georgia, and Alabama and is not included in the time devoted officially to the investigation in question.

I arrived in New Orleans on December 2, and on the following morning proceeded to the sugar experiment station of the Louisiana State University, located at Audubon Park, New Orleans. I was received in the most courteous manner by the director of the station and given every opportunity to make all desired investigations, not only at the station itself, but I was accompanied by him to a number of the representative sugar plantations in the State.

After spending two days at the sugar experiment station I went to the South Mississippi Experiment Station, located at McNeil, for the purpose of inspecting a plantation sirup mill, which is about the nearest approach to the type of sugar mill used in the Philippine Islands. One day was spent on this trip, and on the following day I left New Orleans, accompanied by the director of the Louisiana Sugar Experiment Station, for a trip of inspection of a selected list of sugar plantations and mills.

The first stop was made about 30 miles out of New Orleans, at Reserve Plantation, owned by the estate of Leon Godchaux and considered the most modern mill in Louisiana at the present time. This mill is under the management of Mr. Edward Godchaux, who received us very courteously and took considerable pains in showing us through the mill and over the plantation. He also provided a carriage and guide to take us to two adjacent plantations, one of which was very antiquated and now makes only sirup, while the other had a new type of evaporator which is even more modern than those used in the Reserve mill. One day was spent in the vicinity of the Reserve, and the trip was continued to Baton Rouge that night.

On the morning of the 7th we left Baton Rouge accompanied by Doctor Coats, chief chemist of the Sugar Engineering School of the Louisiana State University. After crossing the Mississippi River from Baton Rouge to Port Allen we took a train for Plaquemine, and from there we went by automobile to the sugar plantation of Mr. Le Blanc, where we found one of the old-type mills, which has recently undergone considerable improvement and now uses chemical control. After a brief inspection of the mill and a trip through some of the principal roads of the plantation we left for the mills of the Messrs. Gay, father and son. Both of these are very old mills, but the one operated by the son has been recently rebuilt and some of the most modern machinery in existence has been installed. We also made a very brief stop at a small sirup mill, but did not have time to go over the plantation, as we were returning to Baton Rouge that night.

On the morning of the 8th I visited the Louisiana State University, where I was shown over the laboratories of the Sugar Engineering School. I was requested by President Patterson to give a talk to the students on the Philippines and consented to do so. The students and faculty assembled in the auditorium at 11 a. m. and showed unusual interest in the subject. During the afternoon I visited the experiment station grounds just outside of the city of Baton Rouge, and returned in time to take a train for New Orleans that night.

The next three days were spent in New Orleans at the Sugar Experiment Station, the Sugar and Rice Exchange, and in visiting the Henderson Sugar Refinery.

On Monday, the 13th, I visited a large sugar mill located 20 miles down the Mississippi River from New Orleans, which had only recently been considered more or less of a failure. It was, however, being operated by a new firm which had it under lease at the time of my visit, and was of considerable interest on account of the fact that it was originally constructed by an English firm who installed largely British machinery. A small subsidiary firm was taking a part of the bagasse from this mill and manufacturing it into paper, but unfortunately the factory was not running at the time of my visit.

I had been requested by President E. B. Craighead, of Tulane University, to deliver a lecture before the students on the 14th, and on this occasion I used stereopticon illustrations made principally from photographs secured from the Bureau of Science before leaving the Philippines. A number of persons prominent in the sugar business of Louisiana were present at this lecture, and many of them expressed surprise at my statements of the existing conditions in the Philippines as compared with the distorted information which had been published in the American papers from time to time in opposition to the abolition of the tariff on Philippine sugars imported into the United States.

At noon on the 15th I left via the Southern Pacific Railroad for San Francisco, and sailed on December 21 for Honolulu. I arrived in Honolulu on the morning of December 27, and spent the remainder of that day getting settled at a hotel.

On the morning of the 28th I went to the sugar experiment station of the Hawaiian Sugar Planters' Association, where I was cordially received by Mr. Charles F. Eckart, the director. I told him the object of my visit and asked him to assist me in planning an itinerary for the time available for the investigation in the Hawaiian Islands. In view of the fact that this

station does not operate a sugar milling plant and has only small experimental plots of cane in the city of Honolulu, it was decided that nearly all of the time should be spent on a selected list of plantations located on the Islands of Oahu, Maui, and Hawaii.

On the morning of the 29th I left Honolulu for the Ewa mill and plantation. On account of rain that day I was unable to go over the plantation, but inspected the mill and had a long conference with the manager. Late in the afternoon I continued the trip around to the windward side of Oahu and spent the night at Haliewa Hotel. On the 30th I visited the plantation and mill of the Wialua Agricultural Company, about 2 miles from the hotel. The general superintendent was very attentive and devoted much of his time personally to showing me over the place in his private automobile, and the chemist of the company was detailed to show me over the mill, which is one of the most modern in the Hawaiian Islands. I returned to Honolulu that night and on the morning of December 31 visited a number of the sugar agencies and banking firms who have charge of the financial matters and products of the principal plantations in the Hawaiian Islands for the purpose of securing letters of introduction to their respective mill managers in Maui and Hawaii.

That evening at 5 o'clock I embarked on the interisland steamship *Claudine,* which makes almost a complete circuit of Maui and stops at the principal ports of Hawaii. About 8 o'clock on the morning of January 1 we reached the port of Kahului, where the firm of Alexander & Baldwin have control of the group of plantations known as the Hawaiian Commercial and Sugar Company. I made a brief visit ashore and looked at the northern end of one of these plantations, but the time during which the steamer remained in port was not sufficient to go inland to either of the mills. Besides, all work was suspended on account of its being a legal holiday. The remainder of the day was consumed in visiting a number of small ports between Kahului and Hona Bay. About 9 o'clock that evening the boat proceeded to the Island of Hawaii and reached Hilo at 6 a. m. on Sunday. After going ashore I took the train to Glenwood and went by stage to the Volcano House, where I spent the day. On Monday, the 3d, I proceeded to the Olaa sugar plantation located between Glenwood and Hilo. The general manager met me at the station with his automobile and showed me over the plantation, on which he was just beginning that day to harvest the 1909 crop. I was shown through the mill by the sugar chemist and inspected the experimental plots with the agricultural chemist of this firm. I returned to Hilo that night.

The following morning I drove to the Waiakea sugar mill, where I spent the morning going through the mill and over the plantation. The manager took me on a special train over the plantation railway to see certain points of interest, particularly the cutting and loading of cane. During the afternoon I drove to the mill of the Hilo Sugar Company, which is being entirely reconstructed, and spent several hours with the general manager and engineers, who took great pains in going over and explaining the features of the new plant as compared with the old one which was being rejected. On January 6 I paid a brief visit to three plantations north of Hilo—Honomu, Pepeekeo, and Onomea.

On the morning of the 7th I took passage on the interisland steamship *Mauna Kea* for Honolulu, reaching there about 6 a. m., January 8.

During the day I again visited the experiment station of the Hawaiian Sugar Planters' Association, and on Monday, the 10th, left for the plantation of the Oahu Sugar Company, at Waipahu, on Pearl Harbor.

On the morning of the 11th I visited the plant of the Honolulu Iron Works, accompanied by Mr. Marston Campbell, director of public works of Honolulu, and Mr. Kopke of the firm.

On the 12th I returned to the Ewa mill by special invitation of the general superintendent, who took me over the plantation railway line in a motor car to see the field work, pumping plants, Filipino village, hospital, steam plows, and many other things of interest.

On the 13th I went aboard the steamship *Korea* and sailed at 5 o'clock that afternoon for Manila, arriving here on the morning of February 3, 1910.

All observations made on plantation organization and equipment, general management, and sugar production will be embodied in a separate report.

THE AREA OF LAND ACTUALLY CULTIVATED WITH SUGAR CANE IN 1908 AND THE AREA OF LAND ADAPTED TO SUCH CULTIVATION, BY PROVINCES.

[This information was furnished by the Acting Collector of Internal Revenue and was compiled from the declarations of sugar growers on file in his office.]

Provinces.	Area of growers' land actually cultivated in sugar.	Area of growers' land adapted to sugar culture, but not so planted.	Provinces.	Area of growers' land actually cultivated in sugar.	Area of growers' land adapted to sugar culture but not so planted.
	Acres.[1]	*Acres.*		*Acres.*[1]	*Acres.*
Agusan	43.79	89.78	Masbate		
Albay	412.27	211.88	Mindoro		
Ambos Camarines	2,572.70	2,099.50	Misamis	149.41	
Antique	398.16	922.20	Moro	2,695.31	100.60
Bataan	9,019.62	29,536.16	Nueva Ecija	1,557.24	262.91
Batangas			Nueva Vizcaya		
Benguet	451.84	1,131.16	Occidental Negros	61,127.56	91,498.68
Bohol	6,877.99	2,263.88	Oriental Negros	5,799.56	3,707.47
Bulacan			Palawan		
Cagayan	843.60	2,860.68	Pampanga	33,347.00	34,595.51
Capiz	2,532.54	5,301.86	Pangasinan	3,210.26	1,684.81
Cavite	4,832.60	13,245.50	Rizal	1,021.76	510.89
Cebu	481.65		Samar	211.63	36.65
Ilocos Norte	3,832.53	5,314.70	Sorsogon	35.07	
Ilocos Sur	6,196.14	19,131.76	Surigao	49.99	46.51
Iloilo			Tarlac	15,765.10	12,176.75
Isabela	2,506.61	20,242.93	Tayabas	153.75	7.15
La Laguna	1,053.08	380.50	Zambales	96.38	257.00
La Union			Manila		
Lepanto-Bontoc	1,008.25	2,673.33	Total	168,263.39	250,290.74
Leyte					

[1] 1 acre = 0.4047 hectare.

PINEAPPLE GROWING IN PORTO RICO.[1]

By H. C. Henricksen and M. J. Iorns.

THE DOUBLE ROW SYSTEM.

For double rows the beds are laid off by plowing several furrows together and using some hand work in finishing off. The plants are set from 12 to 22 inches [2] apart each way, leaving a margin of 6 inches or more on each side of the bed. This system can be used in any kind of soil. It has practically all of the advantages of the one row system, and the disadvantages of plants and fruit falling over is greatly reduced, although it leaves considerable to be desired in that respect. In soils that are inclined to be weedy, the two row system is preferred to any other, but in comparatively clean soils, and especially those containing no joint grasses, beds wide enough to plant from three to six rows of pine are preferable.

THE THREE TO SIX ROW SYSTEM.

In making beds for the three to six row system the same method can be used as for the one and the two row beds, but considerable hand work is needed besides. It is good practice to leave a space of 6 feet between the beds, which should be excavated so as to leave the top of the beds at least 12 inches above the bottom of the walk between the beds. If the plants are set 15 inches apart and six rows to the bed it would require beds fully 7 feet [2] wide. This is not too wide for working easily, provided the land is not weedy, while it almost completely eliminates the falling over of plants and fruit. It has been found, however, that where the soil is not physically well suited to pineapples the rows in the middle of the bed do not produce as well as those on the outside and one should therefore carefully consider the conditions before laying off the beds by this method.

[1] From The Porto Rico Horticultural News, Vol. II, No. 7, July, 1909.

[2] 1 inch=2.54 centimeters; 1 foot=0.3048 meters.

THE WIDE-BED SYSTEM.

The method known as the "wide-bed system," also called "the Florida system," may be used where the conditions are similar to those in Florida, which does not often occur in Porto Rico. The land is marked off with the rows about 18 inches apart and the plants set in perfectly straight lines, which may be as long as the field, but for the sake of passing through the field there ought to be a roadway of 8 feet for every 200 feet of bed. The width of the bed is made 30 to 50 feet, according to the distance a man can throw a pineapple. In harvesting the fruit one man goes into the bed and breaks off the fruit and throws it to a man in the roadway, who catches it and places it in baskets or boxes, which are then hauled to the packing houses. In practice, beds 30 feet wide with roadways 8 feet wide, together with crossroads every 200 feet, make a very convenient field.

PREPARING THE PLANTS.

The young plants, whether suckers, slips, or crowns, are covered with leaves to the very tip of the base. In stripping these leaves off and exposing the stem a number of excrescences will be seen, which are the root buds, some of which may be already developed into roots of considerable length. Many planters maintain that it is necessary to trim the plants, that is, to cut the tip of the base and to strip the leaves off for a distance of 1 to 2 inches. Other planters maintain that this process is not at all necessary. Why is this? The reason is simply the difference in local conditions under which the plants are grown. If a slip is planted without trimming in a dry, sandy soil the roots will form, but instead of spreading out in the normal fashion they will wind around the stem under the leaves. There are two reasons for this. One is that on account of the dry soil the leaves covering the stem remain hard and dry, and the roots would have to overcome great resistance in order to penetrate them; they therefore follow the course of least resistance and develop under the leaves. The other reason is that the plant catches a great deal of dew and water from light rains, which is retained in the heart and leaf axils, from which it trickles down around the base and makes the condition there favorable for root formation, while at a distance of an inch or more from the stem the soil is drier. This growing of the roots around the stem is called in Florida "tangleroot," and these plants are trimmed in order to insure the desired root development. If the plants are set in loamy or clay soil that contains

considerable moisture, the leaves covered up with soil will decay in a short time, and as the soil is as moist a distance away from the plant as close by, the roots will spread out just as well as if the plants had been trimmed. Therefore for planting in a dry soil or in a dry season trim, but for planting in a moist soil or in the rainy season the work is not worth the cost.

The trimming consists in cutting off the base and stripping off the lower leaves, leaving an inch or more of the stem exposed. If large suckers are planted, it is quite common to cut the ends of the leaves off, but this is not desirable, because cutting or breaking the leaves lowers the vitality of the plant.

PLANTING THE FIELD.

The beds being prepared according to the desired system of culture, the rows can be marked off either with an ordinary marker or with a line, but whichever method is used the rows should be straight. The distance between the rows, as well as between the plants, will vary according to the variety and also according to the soil and the system of planting. Pineapples, no matter what variety, do not have an extensive root system, and when planted in single rows 12 to 15 inches apart they have enough room for root development. In beds with several rows, 15 to 18 inches for Spanish and other small varieties and 24 inches for Cabezona and other large varieties is space enough. Under no circumstances should pineapple plants be set over 24 to 30 inches apart in the row, because it is a waste of land, it leaves too much soil uncovered, and increases the work of weeding, while it gives no support for the plants and the fruit.

In planting it is a good plan for one man to drop the plants the desired distance apart and another man to follow with a blunt dibble with which to make holes $1\frac{1}{2}$ to 3 inches deep, according to the size of the plants. The base of the plant is inserted into the hole and the soil pressed firmly down with the dibble and with the foot.

The number of plants per acre[1] will differ, depending on the system of planting adopted. The following table gives the approximate number of plants per acre for the different systems of planting.

[1] 1 acre=0.4047 hectare.

Approximate number of plants per acre.

System of planting.	Varieties.	Distance apart of plants in rows.	Width of paths between banks.			
			3 feet.	4 feet.	5 feet.	6 feet.
		Inches.				
Single row	Small	12	14,520	10,890	8,712	7,260
	Large	15	11,616	8,712	6,969	5,808
Double rows	Small	12 by 12	21,780	17,424	14,520	12,446
	Large	15 by 15	16,366	13,282	11,022	9,504
Three rows	Small	15 by 15	19,038	16,032	13,926	12,324
	Large	18 by 18	14,520	12,445	10,890	9,379
Four rows	Small	18 by 18	15,488	13,620	12,232	11,120
	Large	24 by 24	9,680	8,712	7,920	7,260
Five rows	Small	18 by 18	16,133	14,520	13,200	12,100
	Large	24 by 24	9,900	9,075	8,377	7,778
Six rows	Small	18 by 18	16,594	15,151	13,939	12,906
	Large	24 by 24	10,050	9,334	8,712	8,166
Thirty rows	Small	18 by 18	18,630	18,264	17,889	17,514
	Large	24 by 24	10,710	10,539	10,371	10,209

HOW THE PINEAPPLE PLANT GROWS.

If the soil in which the pineapple plant has been set is moist, root development will take place at once and the roots will be able to take up the food elements as soon as needed. These elements in solution are carried through the roots up to the stem and to the leaves. In the leaf cells, by action of the sun and the green coloring matter which we call "chlorophyl," these food elements from the soil and carbon dioxide from the air are combined with water into food for the plants in ways not yet fully understood. This food consists of many complex chemical compounds, the best known of which are the sugars and starches. From the leaves the food is carried in solution to all parts of the plant wherever needed. Both sunshine and chlorophyl are necessary to the formation of the principal food, so that a leaf losing its color loses its power to form food. It is thus seen how important a large, healthy leaf is to the formation of a good fruit.

Food not needed immediately is stored up in the plant tissues, usually in the form of starch, and it is this reserve supply that carries the plant over periods of hardship and vitally enters into the formation of extra-grade fruits. It is probably due to this that, as a rule, the pineapple plants that have a longer period for development will give larger fruit. They have, as it were, more accumulated reserve energy to use in the severe strain of fruit producing.

The root system of the pineapple is shallow and usually does not extend much over 6 inches in each direction. Among the larger varieties it is not uncommon to find a few roots extending

10 to 12 inches from the stem, but the main portions are matted closely together within a distance of from 4 to 6 inches.

The development of the root system is of great importance in considering planting, cultivating, and fertilizing. It will be readily understood that the plants can be set as close as 12 inches apart without the roots interfering. It will also be seen that cultivation must necessarily be shallow, especially close to the plants, and in fertilizing it would be a waste to spread the fertilizer in the middle, where the rows are 3 feet or more apart.

Where small slips are set in sandy soil it is not unusual to find them filled with sand, especially after a heavy rain or wind. This is detrimental to the plant, and the sand should be washed out by pouring water directly into the heart from a sprinkling can with the nose removed. It may also be prevented by dropping a pinch of cotton-seed meal, dried blood, or tobacco dust, or a mixture of any of these materials, into the heart immediately after planting. This, by filling the cavity, will prevent the sand from entering, yet, unlike the sand, it will not choke the plant.

CULTIVATION.[1]

On account of the shallow root growth and the close planting cultivation is confined almost entirely to hand work. With the single-row or narrow-bed system some horse work can be done the first season, but after that the leaves interlace, and with horse cultivation more or less damage is caused by breaking and tearing the leaves. The extent of the damage compared with the difference in the cost of cultivating will naturally determine the best method to be employed, but some hand work will always be necessary. On the sandy soils in Florida the scuffle hoe is generally used, but on the heavier soils in the West Indies it is necessary to use the ordinary hand hoe, not alone on account of the heavier soil, but also because of the much more abundant growth of weeds. Wherever the land is weedy cultivation should be strictly attended to, because a crop of weeds is detrimental to the growth of the pineapple plant; and if left to grow, large weeds are much more difficult to eradicate than if attended to in time.

FERTILIZERS.

A great many soils in the West Indies can produce pineapples without being fertilized, but the writers have not noted a single instance where an application of the proper kind of fertilizer did not exert a beneficial influence, either on the fruit or on the

[1] From the Porto Rico Horticultural News, Vol. II, No. 8, August, 1909.

plant or on both. Although the pineapple belongs to the natural order of *Bromeliaceæ*, many of which are air plants, the pineapple requires more than air for its development. It is true that it does grow in poor soils, but the Florida planter learned many years ago that no fertilizer meant few pineapples, most of which were too small to ship. In the West Indies the soils always produce the largest plants but never the best grade of fruit, and here fertilizers become necessary in order to improve the quality.

ACTION OF FERTILIZERS.

In dealing with fertilizers the only elements in which we are interested are nitrogen, potash, and phosphorus. The action of nitrogen is specially important in the formation of foliage; therefore a soil containing large amounts of it compared with potash and phosphorus produces large plants. For fruit potash is the ingredient specially needed, and its part seems to be to give firmness and shipping quality as well as flavor. The stimulating action of a fertilizer can often be detected in the plant a few days after it has been applied, and with a little experience the grower can tell when his plants need fertilizing. The lack of fertilizer is usually manifested in a turning of the leaves from dark to a lighter green, often light-red color. The change of color can also be caused by a lack or an excess of moisture or by insects at the roots, but often, even in those cases, an application of fertilizer will restore the normal color.

On account of the method of application, it is essential that the fertilizer ingredients should not be caustic or acid so as to injure the foliage. As all inorganic salts cause more or less injury when applied in the heart of the plant, it becomes necessary to employ some of the ingredients in an organic form. For nitrogen neither nitrate of soda nor sulphate of ammonia can safely be used in the crown. As a source of nitrogen cottonseed meal is very good and dried blood is very desirable also, as well as high-grade tankage.

For phosphorus it is not safe to use the acid phosphate in large quantities, especially the double acid phosphate, which seems to be more acid than the regular 14 to 15 per cent product. Steamed bone is very good; it causes no injury, and the pineapple will be able to take from it as much phosphorus as is needed, provided it is thoroughly steamed and well disintegrated. A ground bone in which the particles are granular is not so valuable, because the phosphorus in it is too slowly available. Basic slag can also be used, but although it does not cause as

much damage to the foliage as acid phosphate it should be used with caution.

For potash the sulphate should be used, either the high grade, containing 50 per cent potash, or the low grade, containing about 27 per cent potash. Ordinarily these salts cause no injury but experiments have shown that it is not safe to apply potash alone to small plants, although a pinch may be safely scattered in the leaf bases of large plants.

VARIETIES.[1]

To classify the varieties of pineapples in the West Indies in such a manner that the classification may be of practical value to the planters seems an almost hopeless task. In Porto Rico alone the same variety shows distinct characteristics in the different parts of the island, and the varieties imported from other West Indian islands under given names are wholly different from those already growing in Porto Rico under those names. Furthermore, new types are constantly originating from seeds. Types are formed by degenerated varieties escaped from cultivation, and some are found in the Manatí section in Porto Rico of which it is difficult to judge if they have ever been under cultivation. The varieties known and commonly planted in Porto Rico until a few years ago were Cabezona, Pan de Azúcar, and Negrita. In the last few years the variety known as Red Spanish has been planted extensively, and several varieties have been imported from the various West Indian islands for the experiment station and a few cases by individual planters.

CABEZONA.

In Florida the Cabezona is classified as the Porto Rico, which would indicate that it came to Florida from Porto Rico. It is not known whether it originated in Porto Rico, but, according to hearsay, it has been grown at Palmarejo, a village about 2 miles west of Lajas since the earlier part of the nineteenth century. In 1903 the entire planting at that place amounted to about 135 acres, and the amount of fruit shipped from there was approximately 140,000 pines. At that time there were about 100 acres planted to the Cabezona in the Bayamón section also, but it was noticed that the plants were smaller, the leaves narrower, the color lighter, and the fruit distinct in flavor from the Palmarejo fruit.

The Cabezona is one of the largest varieties grown. The plant

[1] From the Porto Rico Horticultural News, Vol. II, No. 10, October, 1909.

is large, with broad, dark green, spiny leaves. The fruits vary in shape from oblong, tapering, often irregularly bulging, to almost cylindrical with regular sides. The Palmarejo fruits average 8 to 10 pounds. Twelve to 15 pounds is very common, and as high as 25 pounds has been reported, although the writers have seen none that weighed over 18 pounds. The color of the fruit is a dark green, turning to bright yellow when ripe. The crown is large and regular and crown slips are not often found. The fruit stalk is large and extends up into the fruit, so that when broken off it leaves a cavity.

RED SPANISH.

Just as in the Cabezona, there is considerable variation in the Red Spanish in the different parts of the island. It is not definitely known who brought in the first plants or where they were brought from, but in 1905 and 1906 large shipments were made from Florida and some from Cuba. Some have been brought in from other islands of the West Indies, so that at present there are a number of strains, but these are not distinct and can not be readily distinguished. Change due to soil, cultivation, and climate are often greater than the strain difference.

In general the fruit of Red Spanish is small to medium, somewhat cone-shaped, and of medium quality. Ofttimes the fruit is so short compared to its diameter that it has a flattened appearance. The eyes are relatively quite large, and when ripe have a bright, clear red color. The plant is vigorous, but not as large as the Cabezona. Its leaves are reddish green at tips, changing to a bluish green near the base. They should be quite wide relative to length, and with heavy thick base. The fruit breaks off clean and close to the base, with little danger of being injured. Just before blooming the center turns bright red, thus affording an indication as to time for fertilizing the fruit.

The plant quickly shows poor growing conditions by turning reddish or losing color and becoming yellow. It is very susceptible to soil conditions and methods of culture. Data from many fields show an average of over five slips per plant, and the writers have often counted twenty and more slips, suckers, and rattoons on a single plant. This rapid multiplication, together with excellent shipping qualities, make the Red Spanish the great commercial variety of the present, though many others surpass it in quality.

Aside from these two leading varieties, there are a large number of native and introduced forms. At the stations some

twenty and more introduced and selected varieties are being tested and a number of seedlings are being grown, but thus far none give promise of soon replacing the Red Spanish or Cabezona. Some of the new varieties produced on the experimental grounds at Miami, Florida, far surpass all other varieties, and one selection made by this station, a variegated Cabezona, gives considerable promise for a fancy decorative pine, but it will be many years before these can be produced in quantities sufficient to supply the markets.

Since the conditions govern size, quality, flavor, and even form, it is not profitable to enter into the description of any of these many varieties. When some variety becomes prominent enough to become a commercial possibility, it will then be time to give a full description.

CORN GROWING IN THE PHILIPPINES.[1]

By Mr. Harold Cuzner,

Farm Superintendent, College of Agriculture, University of the Philippines.

Corn in the Philippines probably ranks second in importance among the grain crops both as to the amount grown and the amount used for food of men and animals.

According to the best information available it seems that there are grown on the average about 14,546,477 cavanes[2] from a total area of 1,011,841 hectares, which would give an average yield of 14 cavanes per hectare. This amount is augmented by the importation of corn in the form of corn meal and mixed feeds.

Leaving out of account the fact that the farmers might grow and feed more corn to advantage in fattening animals, it is evident that the production does not at present equal the demand, and the country is sending out money to buy things which it ought to produce at home.

The question then arises as to how the farmer is to produce more, for he may argue that he is cultivating all the land which he has animals to work. The problem thus resolves itself into one of making the same area of land produce a greater yield than it has done heretofore. There are several ways in which this object can be partially accomplished, namely, by more thorough cultivation, rotation of crops, and by breeding better and more productive varieties.

In going over the country one notes three principal conditions under which corn is grown. The poorest is where it is sown as a catch crop with rice on the unplowed fields of the "kaingin." Then comes that in which it is planted in the well-cultivated fields as a catch crop with cane; and, lastly and best, where it is grown in pure stands on land that has been more or less thoroughly prepared and cared for, according to the ambition and agricultural ability of the grower.

[1] Paper read at the Agricultural Conferences held during the Carnival.

[2] 1 cavan=75 liters.

Poor corn crops are usually attributed to unfavorable weather conditions, and frequently this is a true cause, for there are few seasons in which corn does not suffer during some stage of its growth. The most that the farmer can do is to make the best possible use of the conditions as they exist. There are, however, many things which are or may be put directly under the control of the farmer, and if these are thoroughly looked after the yield may be doubled in the course of a few years. These things may be considered under three heads: (1) the improvement of seed, (2) the improvement of the soil, and (3) the improvement of methods of cultivation.

IMPROVEMENT OF SEED.

The first of these ways of increasing yields is perhaps the most important; more so as it is the least expensive and the most likely to be overlooked.

No man would question the statement that to get a good yield it is first necessary to get as nearly a perfect stand of strong vigorous plants as is possible. It is readily seen that if a farmer gets but 80 per cent of his seed to germinate, which is to say he gets but 80 per cent of a perfect stand, his yield would be decreased 20 per cent, even if all other conditions are favorable. This failure to germinate may be due to many causes, such as injury to the corn in storing or the use of poorly developed ears or grains. Deterioration of vitality may result from bad selection just as much as the reverse may be the result of good selection.

Next, the yield is influenced by the number, size, and character of the ears borne by the plants, and so it is evident that one must attempt to raise plants with the most desirable ears possible as well as use sound seed. In this connection it may be well to first describe what might be considered a good ear.

The ear should be cylindrical in shape and well rounded at each end, as this form affords the largest per cent of grain per ear as well as kernels of the most uniform shape. The cob should be of medium size, of bright color, and possess the property of drying well, so as to be of light weight. The kernels should fit compactly together throughout their entire length on both sides and edges. They should be slightly wedge-shaped looking at them from the flat side, and when looking at them from the edge the sides should be nearly parallel. The length of the kernels should be equal to one-half the diameter of the cob. Soft, chaffy kernels, though long, are not desirable, neither are kernels with prolonged chaffy caps. It is much better to

select for long kernels than for smallness of cob. The germ should be large, smooth, and firm.

The ratio of the length to the circumference of the corn should be about 10 to 7 and is measured at a point one-third of the distance from the butt to the tip.

A good score card for the purpose of judging corn might be made as follows:

	Perfect score.
1. Shape of ears (cylindrical, straight rows, proportion of length to circumference)	10
2. Length of ears (conforming to standard)	5
3. Circumference (conforming to standard)	5
4. Color, grain not mixed	5
5. Color of cob	5
6. Butts well filled	5
7. Tips well filled	5
8. Kernels (wedge-shaped)	5
9. Kernels (deep and long)	5
10. Space between rows	5
11. Space between kernels	5
12. Germ large in proportion to starch	10
13. Market condition	10
14. Vitality; bright, well-matured, firm on cob	10
15. Soundness, freedom from injury	10
Total	100

There are two methods open to the grower by which he may improve the quality of his corn.

One is by field selection and the other is by planting in a breeding plat especially set aside for the purpose.

The first consists in selecting in the field the ears which come most nearly up to the standard, selecting them from the best and strongest plants and using them for seed of the next year's crop. If this practice is thoroughly followed out, the grower will, in the course of a few years, find a very marked improvement in the condition of his crop.

The second method is similar to the first except that the selection may be more rigidly carried out, and as the grower is not relying on this crop for anything except seed to improve his corn, he cuts out from time to time any weak or undesirable plants before they flower, so that they may not pollinate the flowers of the better plants and thus tend to retard their progress.

There have been many methods devised for carrying out rigid selection and elimination, but a discussion of these would be altogether too long to include here. Suffice it to say that by

the practice of these methods the yield of corn in Illinois between the years 1890 and 1900 was increased 22.8 per cent over that between the years of 1880 and 1890 and in Indiana during a period of ten years an increase of 12.8 per cent was made.

In certain experiments made in Illinois the per cent of oil was increased in two years from 4.7 per cent to 7.37 per cent.

IMPROVEMENT OF SOIL.

The opportunities for the improvement of soil offer a wide field for the efforts of the intelligent farmer.

While it is true that proper seed selection and thorough cultivation will greatly increase the average production of corn per acre, it is equally true that the cultivation of corn on very poor land will never be found profitable and should not be attempted until the land has been brought into a fertile condition by the growing and cultivation of leguminous crops and the application of such manures as are obtainable. In the meantime some crops that require less fertility than corn can be grown.

Soils may be rendered unfit for cropping by two conditions—first, by poor physical condition, and, second, by lack of the materials necessary for plant food.

Very compact soils are not desirable, as they do not take up water readily, and if they do take it up are apt to lose it too readily by evaporation. They resist the penetration of roots and the entrance of air. On the other hand, very loose sandy soils are open to the objection that they lose water too readily by allowing it to pass through and escape, carrying with it such soluble plant foods as may be present.

The compact clay soils may be most effectively and cheaply opened by the growing of strong deep-rooted plants, whose roots in decaying leave ducts through which the surface water may pass to greater depths; and by the plowing in of such green material as is available the amount of humus in the soil will be greatly increased, which will aid in keeping it loose and in retaining moisture. The same method of procedure may be used on too sandy and loose soil with equal success.

Of the elements of fertility, nitrogen is the most likely to be lacking, and as it is the most expensive if it is to be bought on the market it is best for the farmer to obtain it by the growing of leguminous crops, such as beans, peanuts, etc., and if the vines are plowed under there is also a great gain in humus.

Potash, which is also often lacking, the farmer may often obtain from ashes; in fact, ashes were for a long time the principal source of potash.

The third element which is likely to be lacking is phosphorus, which is generally applied in some of the commercial forms, such as ground bone, dried blood, or phosphate rock in some of its forms.

A good fertilizer for a corn crop might be composed of 2 per cent nitrogen, 6 per cent phosphorus, and 8 per cent potash, the mixture to be applied at the rate of 250 kilos per acre.[1]

IMPROVEMENT OF METHODS OF CULTIVATION.

It must be observed that methods which give the best results in some sections have failed to give good result in others. For instance, a section with fertile soils and good rainfall will give best yields with thick planting, while other sections with less rainfall or poorer land will require thinner planting. In situations with deep soils and prolonged dry weather good results are obtained by planting in furrows, while on land that is low and wet the farmer must resort to planting on raised beds or on ridges. Often adjacent farms will be so different as to require quite different treatment, so only some fundamental principles of good corn cultivation will be given.

Generally speaking, deep plowing is best on deep, rich soils, provided it is done early enough to allow the land to settle afterwards and if it does not render the soil too loose and dry.

Plowing should not be at the same depth from year to year, as by such a practice the soil is not mixed well and a bad surface is left at the bottom of the furrow where the horses walk and the plow drags. It is well to plow a little deeper each year for several years and then return to the original depth.

The time of planting, like other things, varies with the section. For example, it seems that in the Province of La Laguna there are three crops grown a year, the time of sowing being in December and January, April and May, and August and September. It should not be planted in very wet ground, as the kernels are likely to rot, especially if the soil is heavy.

On low wet land underground drainage will prove most profitable in the end, but the original cost is rather great.

Sometimes the difficulty may be overcome by plowing the land in beds 1 to $1\frac{1}{2}$ meters wide, the furrow between the beds being used to carry off the extra surface water. In this case two rows of corn are planted in each bed.

While many styles of corn planters have been devised, they have not come into any general use here at present nor are they in any way essential to the raising of good crops, though they are

[1] 1 acre = 0.4047 hectare.

of advantage in reducing labor and enabling a greater area to be planted in less time. The proper depth of planting must be governed by the quality and moisture of the soil. If the soil is a stiff heavy clay 3 centimeters is sufficient, while in a light, dry, open soil 9 to 12 centimeters would be more satisfactory. This may best be done sometimes by planting in a furrow and gradually filling it as the plants grow. Some care, however, is necessary in this method of procedure, as the furrow should not be entirely filled until the plants are 30 to 36 centimeters high. This method might be particularly well adapted to seasons in which the plant is to be subjected to more or less drought during the latter part of the season of growth.

The distance between the rows and stalks or hills in the row has a great influence on the production. If planted too close, the yield of stalks is increased at the expense of the yield of ears, while if planted too far apart there is a loss both in stalks and ears. While, as has been stated before, the closeness of planting must depend to a great extent on the richness of the soil, on good land very good results are generally obtained by planting the rows about $1\frac{1}{2}$ meters apart and leaving the stalks 1 meter apart in the rows, though some advocate planting $1\frac{1}{4}$ meters apart and 30 centimeters apart in the row. The only feasible method for the planter to pursue is to try slightly different distances of planting adjoining fields and then select the distance which gives him the best yield.

The importance of cultivation, especially in the early stages of growth, should not be overlooked. The farmer should see that from the time of germinating to the time of maturing the corn should not be subjected to any unfavorable conditions. Poor cultivation or poor soil is generally indicated by the plants being slender and of poor color. Thrifty plants are thick, strong, and of a dark green color.

Before the corn is up or even after it is up several inches the surface crust on the ground and young weeds may be destroyed by the use of horse weeders or harrows.

When the plants are small a cultivator with very narrow shovels that throw the soil but little should be used.

As a general rule frequent shallow cultivation is preferable to deep cultivation, though where the soil has become soaked and compacted from heavy rains deep cultivation will help to dry out and aërate the soil. In doing this care must be taken not to run the shovels of the cultivator too deep near the plant, as considerable injury may be done by cutting the roots.

After the plants have reached a height of 1 to 1½ meters the cultivation even in the middle of the row should not be more than 9 to 12 centimeters deep.

The question as to how often the corn should be cultivated is best answered by stating that it should be cultivated often enough to keep down weeds and preserve a soil mulch 6 to 9 centimeters deep until the corn has completed its growth. This means that it must be cultivated after each rain, but should not be cultivated while the land is wet enough to make mud, otherwise the desired results will not be obtained.

There are many forms of cultivators adapted to different classes of work and conditions, but one of the best for general purposes in this country would probably be a two-horse walking, tongueless cultivator. One of these is easily pulled by two *vacas,* and where tried on ordinary clay land has proven very satisfactory.

DENATURED OR INDUSTRIAL ALCOHOL.

By Mr. Henry Steere,
Deputy Collector of Internal Revenue.

COMPOSITION OF DENATURED ALCOHOL.

Murray defines denature as "to alter (anything) so as to change its nature; e. g., to render alcohol unfit for consumption." Denatured alcohol is made by mixing with ordinary alcohol some substances of a poisonous and repugnant character but which do not detract from the use of such alcohol for industrial purposes. In the Philippines commercial wood alcohol and pyridine are the denaturants employed and completely denatured alcohol is made by adding to 100 liters of ethyl alcohol 2 liters of partially purified methyl, or wood, alcohol and $\frac{1}{2}$ liter of pyridine.

Ethyl alcohol in the Philippines is manufactured from the sap of the nipa plant, the sap of the coconut tree, and from sugar or molasses of sugar cane. About 90 per cent of Philippine alcohol is produced from the nipa plant and is obtained by fermentation, distillation, and, where a high per cent of alcohol by volume is desired, subsequent rectification, although distillation and rectification in some three or four distilleries of modern type are carried on in one and the same machine.

Methyl, or wood, alcohol is obtained by destructively distilling (heating) the wood in iron retorts or ovens and then condensing the vapors. It has a very marked and repugnant odor and taste. The fumes or vapor from it occasion violent headaches and depressed condition, and often blindness when prolonged exposure to such vapors has occurred. Taken internally it nearly always causes blindness or death, and the internal use of wood alcohol is now considered fatal. For these reasons it is an admirable substance for denaturing ethyl or ordinary alcohol.

Pyridine comes as a by-product from the liquid or coal tar

resulting from the destructive distillation (heating) of coal by the retort method. It can also be produced by the refining of bone oil.

THE USE OF DENATURED ALCOHOL IN FOREIGN COUNTRIES.

Great Britain was the first country which attempted to denature alcohol, and denatured alcohol free of internal-revenue tax was first authorized in 1855. Its use, however, was hampered by the early statutes enacted, which were thought necessary to guard the revenues, but which made an effective bar to its more general use as a source of power and in chemical manufacture. Liberal legislation since enacted corrected this phase of its use.

In Germany the use of denatured alcohol was first permitted in 1879. The laws governing it were modified and liberalized in 1887 so that to-day Germany leads the world as a consumer of denatured alcohol in its arts and trades and as a source of fuel, light, and power.

France permitted the use of denatured alcohol first in 1872, and while its use is greater in France than in England, the restrictions of legislation are such that France is far behind Germany in consumption.

The Netherlands permitted the tax-free use of denatured alcohol first in 1865, but Switzerland, Belgium, Italy, Sweden, Norway, Portugal, and Austria-Hungary did not follow suit until the eighties and nineties of the century just closed.

In the United States there was no internal-revenue tax upon distilled spirits between 1817 and 1861, and in the year 1860 about 13,157,000 gallons of alcohol of 95 per cent strength were used for industrial purposes. About four-fifths of this was used for lighting and the balance for the requirements of druggists and that used in the arts and manufactures.

The imposition of the internal-revenue tax on distilled spirits in 1861 and the fact that industrial alcohol rose in price from 35 cents (70 centavos) per gallon[1] prior to 1861 to $3.80 in 1864 increased its cost beyond the possibility of using it in competition with kerosene, which was discovered, refined, and put on the market about this time.

ALCOHOL AS AN ILLUMINANT.

In order to determine exactly the amount of alcohol and kerosene that burners of identical shape would burn in a given time, the following test was made on March 3, 1906, by the

[1] 1 gallon = 3.78543 liters.

Electrical Testing Laboratories of New York (Report No. 1917; Order No. 1859):

Lamp.	1 gallon will last.	Candle-power.	Candle-power hours.
	h. *m.*		
Alcohol	57 5	30.35	1,732
Oil	28 40	30.8	883

The lamps used for kerosene were the ordinary Rochester type, and for alcohol a French alcohol-burning lamp with mantle.

Safety of the alcohol lamp.—The alcohol lamp is much safer than the kerosene lamp, as a fire started from alcohol is readily extinguished by water, which mixes with alcohol in all proportions. Such is not the case with kerosene, as the throwing on of water only serves to spread the fire.

Quality of the light furnished.—The white light furnished by the alcohol lamp is akin to daylight in its quality, and being also extremely steady and uniform it is preferable to the yellow light of the kerosene lamp.

The heat given off by radiation.—This is much less in the case of the alcohol lamp than from a kerosene lamp of equal candlepower, because the flame of the kerosene lamp owes its luminosity to the particles of carbon present, which, not being perfectly burnt, become incandescent in the flame and radiate of necessity a considerable degree of heat, as anyone who has read beside the usual large round-wick kerosene lamp, such as was used in these photometric tests referred to, can testify. These conditions do not occur in the alcohol lamp, as the mantle becomes incandescent and not the flame. The flame of alcohol when burned in the wick lamp is, as is well known, of a pale bluish color and practically nonluminous. Hence the adaptation of the incandescent mantle to the alcohol lamp made it a commercial success, as has been shown.

Maintenance of the alcohol lamp.—As the alcohol lamp burns no wick, it is free from this troublesome feature invariably connected with the use of kerosene. The alcohol lamp does not smoke and is practically odorless.

The alcohol lamp has proved an entire success as well for exterior as interior lighting.

ALCOHOL AS A FUEL.

Manufacturers have placed upon the market in various countries for the use of denatured alcohol stoves of from one to four burners for cooking, flatirons, heaters for curling tongs, Bunsen burners for laboratory use, torches for soldering and paint removing, coffee percolators, chafing dishes, and traveling companions. Some of these latter are made for the simultaneous cooking of coffee, cereals, eggs, etc., for two persons, and when closed occupy a space $3\frac{3}{4}$ inches [1] high by $3\frac{3}{4}$ inches in diameter.

The blue flame in the various implements using denatured alcohol gives but slight heat from radiation while giving an intense heat beneath the receptacle set over it. This is a peculiar and distinct advantage for use in a tropical climate.

ALCOHOL AS A SOURCE OF POWER.

Germany has been the leading exponent in the development of denatured alcohol for the past twenty years and has long since passed the experimental stage in utilizing alcohol for power. The efforts of the motor manufacturers had been long ago directed to producing from agricultural sources a native combustible or fuel which could be economically used in motors, and this was successfully accomplished, and their low running cost and maintenance and, not the least, their merit in lessened danger from fires have all tended to universally introduce these motors for industrial agricultural operations in that country. In addition to their agricultural use, alcohol-using motors are found in mining railways and in some of the forest railways.

In Germany likewise the automobile is successfully driven with denatured alcohol. The success attained with the automobile as with other motors, when compared with the lack of success in other countries, is not only due to the excellent class of engines constructed, but to liberal government regulations permitting a $1\frac{1}{4}$ per cent denaturant to be used in mixing alcohol for use in motors.

In the Philippines for the past year Ynchausti & Co., of Hagonoy, Bulacan, have been successfully operating a kerosene engine with alcohol and for the past several months a launch; while the Tabacalera Company have been successfully operating an alcohol-using launch on the Cagayan River in the Provinces of Cagayan and Isabela, both of these concerns operating under Government control and observation.

[1] 1 inch = 2.54 centimeters.

THE COST OF DENATURED ALCOHOL.

Denatured alcohol may be procured from the denaturers at from ₱2 for 15 liters (a trifle over 4 gallons) to ₱3.75 for the same quantity. The difference in price does not refer to quality, as denatured alcohol must, under the law, be 90 per cent or upward alcohol by volume.

(The reader is referred to Herrick's "Denatured or Industrial Alcohol" and "Rules and Regulations of the Commissioner of Internal Revenue of the United States.")

AGRICULTURAL CONDITIONS IN THE ISLAND OF CEBÚ.

By H. A. Ireland,

Agricultural Inspector.

It would be impossible to make a complete, comprehensive report of the agriculture of the Province of Cebú from a two months' visit at this season of the year (October and November), but I have been able to observe methods of planting, cultivation, harvest, etc., and from these one can, in a way, compare actual results with possibilities.

My trip has included nearly all municipalities from Dalaguete to Daan-Bantayan on this coast—Dalaguete, Argao, Sibonga, Carcar, San Fernando, Naga, Talisay, Cebú, Mandaue, Liloan, Danao, Carmen, Catmon, Tabogan, Bogo, and Daan-Bantayan—and the municipalities of Dumanhug, Barili, Toledo, Balamban, Asturias, and Tuburan on the opposite coast.

My work, aside from looking up the corn supply and price of that product with a view to purchasing for the Bureau, has been to visit some of the various plantations—with the owners, where it was possible—suggest errors in methods in common use and discuss other methods with hacenderos and municipal officials, investigate agricultural reports of municipal presidents, collect samples of different varieties of grain, etc.

Regarding the collection of grain samples, I have found it difficult to obtain good, pure samples of rice, and next to impossible, in many cases, to be sure of the identification of distinct varieties, on account of the confusion of names in different localities, many varieties having two, three, or more entirely different names; and good samples of corn, especially in the ear, are not obtainable at this season.

The reports of municipal presidents, while often prepared evidently with much care, I find to be often entirely misleading and inaccurate both as to form and figures (horses die with rinderpest, animals dying from disease and killed for food are not separated), and crops are planted and harvested within the

same three months when it is clearly not possible. I have endeavored to impress the men who have this work to do with the importance of submitting reports that conform as nearly as possible to facts and actual conditions.

In observing various crops in different parts of the province, I have found a common and invariable practice of close setting or seeding. From corn to coconuts, from two to four times as many plants are growing on the land as it can well support. This condition, with lack of proper preparation of the soil prior to planting, of sufficient cultivation of the growing crop, of care in seed selection, and of fertilization and change of crops, unquestionably reduces the yield of all products far below what they might be made with very little more work and thought. The heavy, clayey soil of most of the tillable land makes thorough tillage especially desirable, and the need of the natives for improved implements is urgent. The only plows in use are the poorest type of native plow without moldboards, and are very unsatisfactory; however, the moldboard plows that have been tried have proven unserviceable on account of the texture of the soil. Implements of any kind as well as draft animals are scarce, and many farmers depend entirely upon bolos to plow their land and plant and harvest their crops.

By far the greater part of the island is hilly or mountainous and untillable. In some parts, however, where the hills are not too high or steep they are entirely under cultivation from one coast to the other, as between Carcar and Barili, along the Government road. The crop on these hills is almost invariably corn, although the soil as a rule is shallow and rocky and not all adapted to corn production. The result is what might be expected.

The prevalence of this rough, stony soil, with the stretches of poor beach sand along the coast, would seem to indicate that maguey should be the principal export crop of the province, and in certain districts it is becoming one of the leading products. I was told that from Bogo in the north part of the island some 800 picos of fiber (50,600 kilos) were shipped last year and that the amount for the present year will reach 1,200 picos (75,900 kilos). The Bogo Daan Bantayan district not only leads in the area of maguey under cultivation but also in the quality of fiber produced. Planters there are more enthusiastic about the crop than in other districts, some of them being perhaps a little overenthusiastic, as maguey may be seen growing on land better adapted to more profitable crops. In other districts farmers meet arguments in favor of extensive planting of maguey

with numerous objections—the price is low; the process of cutting leaves and extracting fiber is slow and tedious; there are no machines, and the cost of transporting leaves from field to seashore for retting where the distance is great would consume the value of the product, etc.—and it must be admitted that their objections have some foundation. The objection regarding the price could be at least partially removed by the improvement of the quality of fiber, but this will be a difficult thing to effect, as the people, in spite of all instructions and arguments to the contrary, persist in too close planting, overcutting and cutting too young. Plants are often set out not more than 1 or 2 feet apart (about 3 to 6 decimeters) in the rows and are cut when only a year or two old, only a few of the upright leaves being left. Then, insufficient care is given to cleaning and bleaching the fiber and the result is a product of such low grade as to be scarcely marketable. A few of the more progressive planters, however, are coming to follow better methods of planting and are investigating other means of extracting the fiber, and doubtless, in time, as the results are seen, their example will be followed by others.

I have received numerous inquiries in regard to cost, capacity, etc., of machines, but while many are interested, the cost of purchasing and operating a steam-power machine is prohibitive to practically all producers. A practical hand or animal-power machine of moderate cost would do much to increase the area and output of the crop. I have heard reports of fiber being cleaned cheaply, quickly, and well by being first crushed in a sugar mill and then boiled for a few minutes in water. I personally tried the experiment twice, but found it impossible to crush the pulp so that the fiber could be separated by a reasonable amount of boiling without injuring the fiber. I believe, however, it would be practicable to crush the leaves instead of tearing them into strips preparatory to retting. The method would be specially advantageous where fields are a distance from water, as crushed leaves are much lighter than uncrushed and can be transported at considerably smaller expense; also, being broken and comparatively dry, they will absorb the outer water more readily, and, I believe, the fiber can be separated after three or four days instead of eight, as are ordinarily required.

It would mean a big thing for the province to have the native maguey replaced by the Hawaiian variety. A few small patches have been started through the efforts of the railway company, but they are not at all common.

At San Fernando I found maguey quite badly infested with "mealy bug." It is not likely that this bug would ever become a serious pest, although some of the plants I saw were considerably damaged. In other fields in a number of localities I found plants with the leaves dying from the points down, whether from fungus or sun scald I could not say. I presume this is the same trouble that Mr. Byars found when he was here some months ago. In some places it is now common enough to be serious. If one cares to look for possible enemies of the crop, he can find another in dodder. I have seen but one field threatened by this, but it suggests a possibility that it might be well to consider.

Rice is not an important crop in this province. From Cebú south to Argao there is some lowland rice grown and at other points along the coast smaller amounts are produced, while in the highlands there is some mountain rice, but the total crop is insignificant when compared with the population. Some rice is imported and corn is largely used as a substitute. There are said to be some thirty or more varieties of rice grown in the province, but I have been unable to find that many, and of those of which I secured samples I am not sure that some are not the same with different names. The season of planting seems to vary considerably even in the same locality. Between Cebú and Argao I have seen fields nearly ready for harvest and others being planted at the same time.

Corn is the main food crop and the crop most generally grown. Other crops are grown more or less by localities, but corn is raised from one end of the island to the other, in some parts three crops being planted annually. The yield, even for the principal crop, which is taken off from July to September, is light, and the others, or at least the one maturing at this time, produce almost nothing. This is not surprising when the methods of culture are known. Ground that is fit for nothing but maguey is planted to corn, the seed being dropped in a hole made with a sharpened stick or bolo; on good land young corn grows between the rows of the preceding crop, the ground not having been stirred before the seed was put in; rows are often planted too close together, and three to six plants growing in a hill are common, if not the rule. The growing crop is often tended, where the owners have animals and plows, as well as can be done with the implements used, but these merely break up the soil into large clods without pulverizing it in the least. In other cases the only cultivation is by bolos and consists in cutting out weeds and grass without stirring the soil. Effective

hand implements and light cultivators that would pulverize as well as break the soil should make a great difference in the amount of corn produced in Cebú. The kind and quality of seed planted also needs improving. Any lasting benefit is hard to realize where small quantities of improved seed are introduced into a district on account of the difficulty of keeping it pure. I have thought that something might be accomplished if enough good seed corn could be put into a community to plant all the corn land of the district, the planting of any other seed being prohibited. If a good crop resulted, seed could be drawn from it to plant adjacent communities and in this way gradually scattered over the entire province. Even careful selection of native seed would accomplish much if it could be induced.

Conditions here are considered quite favorable for sugar cane and considerable sugar is produced at the present time, though not, I am told, nearly as much as was produced formerly. Along the coast, especially from Naga to Liloan, there are some good fields and a number of mills, but on the opposite coast, from Toledo to Toburan, where sugar was formerly the one great crop, there is scarcely a field of cane to be seen. In this district there used to be a number of steam mills, but these were destroyed by the insurgents and have never been rebuilt. Later, rinderpest destroyed most of the work animals, and the cane disappeared for lack of means to handle it. In the north end of the island beyond Bogo there is also much valuable sugar land, and the farmers are trying to get this planted to cane and are now making some sugar, but for some time locusts have been so destructive through the district that the area of cane is less now than it was a year ago, and many devastated fields are still being broken up and planted with corn, to be reset to cane as soon as it can be done. I noticed, particularly, one large tract in this section on which even the cogon appeared dead as the result of the work of locusts. People are doing little to check them and may reasonably expect frequent recurrences of the trouble.

Tobacco is an important crop in many municipalities and is grown to some extent in nearly all that I have visited. I have seen but little of it since my arrival here, however, as setting has only lately been begun.

Coconuts are also a valuable crop and should be much more so than they are. There is plently of vacant land adapted to the trees that could be so utilized, and the trees already growing could be made more profitable under better management. They are always crowded together, nothing is done by way of cultiva-

tion, and no attention is given toward keeping the groves clean, destroying dead trunks, etc., where beetles might breed. Practically all of the groves I have seen are along the coast, making a fringe nearly around the island. As far as I have observed but little oil is manufactured from the nuts, the crop being shipped from Cebú as copra.

Some of the minor crops of the island are interesting for the home industries they provide. From Dalaguete to Oslob there is much shrub cotton produced, and in towns and barrios of the section spinning and weaving the fiber is quite an important industry. The fiber is ginned by a rude arrangement consisting of two small hardwood rollers fitted close together, like the rollers of a wash wringer. Being quite rigid and fitting too close to permit the seed to pass between them, they pull the fiber through, leaving the seed behind. The process can not be called rapid. The fiber is short and rather harsh, but it makes a very serviceable coarse cloth and is also used in the manufacture of fish lines, nets, etc.

In the mountains, especially toward the south, some abacá is grown. A great deal of this fiber is utilized in making fish nets. The lighter ones are largely woven in Talisay and Danao. In the latter town some work is also done with pineapple fiber produced there and in Liloan.

In Argao sabá weaving is the common industry of the homes. The town is one large grove of the big banana. From Mandaue to Danao the manufacture of buri products is important. In Danao some fine hats are made, but by far the greater part of the product is used for making sacks, ropes, etc. A harsh rope, said to be very strong, is made from the coarse fibers of the leaf stem.

Regarding the improvement of agricultural conditions in the island, I have discussed the coöperative idea with a number of planters, and most of them have said they would be glad to see the proposition tried, some expressing their willingness to furnish land, animals, implements, and labor to work under the direction of a competent supervisor. The idea appeals to me as one that could be made productive of much good at small expense if properly carried out, and I believe that nothing but some such method will ever produce the results we hope for. The people who need help most are a class very difficult to teach by verbal or written instructions, and if an example could be given them in connection with such instructions there is reason to believe they would gradually adopt better methods and in time produce a very material change for good in the condition of their province.

ESTIMATED COST OF PLACING 500 HECTARES UNDER COCONUT CULTIVATION UP TO PRODUCTION STAGE.

By M. M. Saleeby.

The following is an estimate of the cost of establishing a coconut plantation. The size of the plantation selected is 500 hectares. Planting 100 hectares a year, it will take five years to put this amount of land under cultivation. It should be understood that the profit from the plantation store and the income from the sale of the various secondary crops, for the cultivation of which allowance is made in the estimates, will not only pay for all incidental expenses that may occur, but will also considerably reduce the expense of the upkeep of the plantation. All accounts in this statement are in Philippine currency, and the rate of interest is not included in the estimates.

First year.

Cost of 500 hectares of Government land, at ₱10	₱5,000
Clearing 100 hectares of forest, at ₱30 per hectare	3,000
Cost of 12,000 coconut seeds (1,000 allowed for lack of germination), at ₱40 per thousand	480
Lining, holing, and planting 100 hectares, at ₱8	800
Manager's salary (₱3,600) and subsistence per year (₱1,000)	4,600
Manager's residence (₱800) and men's quarters (₱200)	1,000
One native overseer, at ₱30 per month	360
Half cost of survey of 1,024 hectares of Government land	250
Tools	200
Three carabaos or cattle, at ₱80 per head	240
Two horses, at ₱50	100
Fencing 100 hectares	2,500
Total	18,530

Second year.

Clearing 100 hectares of forest	3,000
Cost of 12,000 coconut seeds	480
Lining, holing, and planting 100 hectares	800
Fencing 100 hectares	2,000
Clearing underbrush from 100 hectares, at ₱5	500
Manager's salary and subsistence	4,600
Two native overseers, at ₱60 per month	720
Additional tools	200
Depreciation in tools, animals, buildings, etc	300
Total	12,600

Third year.

Clearing 100 hectares of forest	₱3,000
Cost of 12,000 coconut seeds	480
Lining, holing, and planting 100 hectares	800
Fencing 100 hectares	1,500
Clearing underbrush from 200 hectares	1,000
Manager's salary and subsistence	4,600
Additional buildings and tools	300
Depreciation	300
Two native overseers	720
Total	12,700

Fourth year.

Clearing 100 hectares of forest	3,000
Cost of 12,000 coconut seeds	480
Lining, holing, and planting 100 hectares	800
Fencing 100 hectares	1,500
Clearing underbrush from 300 hectares	1,500
Manager's salary and subsistence	4,600
Repairs and improvements	200
Two native overseers	720
Depreciation	360
Total	13,160

Fifth year.

Clearing 100 hectares of forest	3,000
Cost of 12,000 coconut seeds	480
Lining, holing, and planting 100 hectares	800
Clearing underbrush from 400 hectares	2,000
Manager's salary and subsistence	4,600
Two native overseers	720
Repairs and improvements	200
Depreciation	360
Total	12,160

Sixth, seventh, and eighth years.

Manager's salary and subsistence, at ₱4,600	13,800
Two native overseers	2,160
Clearing underbrush from 500 hectares	7,500
Depreciation, improvements, etc	1,500
Total	24,960
Grand total	94,110

EXPORTS OF COCONUT PRODUCTS FROM THE PHILIPPINE ISLANDS FOR THE YEAR ENDING JUNE 30, 1909.

[From the Quarterly Summary of Commerce of the Philippine Islands, April-June, 1909.]

Country.	Copra.		Coconut oil.	
	Amount.	Value.	Amount.	Value.
	Pounds.		*Gallons.*	
United States	10,391,630	$287,484	292,823	$127,893
United Kingdom	2,007,950	69,311	70,796	29,432
Germany	9,529,972	306,280		
France	138,387,301	3,902,393		
Spain	30,861,371	857,249		
Italy	12,802,710	358,710		
Austria-Hungary	669,317	18,240		
Belgium	20,260,953	634,288		
Portugal	223,105	5,900		
Hongkong			63	100
Japan	283,769	8,620	1,022	450
British East Indies	7,310,038	209,265		
French East Indies			84	41
Total	232,728,116	6,657,740	364,788	157,916

Copra in 1909 further confirmed its increasing importance as an export of the Philippines and ranked second only to hemp, with a value of $6,657,740. The average price was slightly less than in 1908, but the quantity increased from 75,211 tons to 103,896 tons, with an increased value of $1,196,060. The greater part of it found a French market as in the past. Spain continued the leading purchaser of secondary importance, but Belgium assumed a new prominence in the trade and was credited with $634,288 worth. Exports to the United States were relatively unimportant, and though of the increased production American purchases amounted to $287,484, as compared with $228,565 in 1908, the growing market of the United States is still chiefly supplied from other sources.—*Extract from the Report of the Chief of the Bureau of Insular Affairs for 1909.*

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

MARCH, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Total.
Rice	Quantity	Kilos	5,013,900	5,876,877	1,537,373	113,867	236,744	3,829		2,782.590
	Value	Dollars	144,833	168,426	43,200	4,016	8,248	176		368,899
Beef cattle	Quantity	Numbers	5,780	40	481		5			6,306
	Value	Dollars	88,555	891	10,092		159			99,697
Hogs	Quantity	Numbers	9							9
	Value	Dollars	18							18
Sugar	Quantity	Kilos	113,251	14,652	23,523	4,951	6,795	374		163,546
	Value	Dollars	8,566	1,172	1,619	371	530	40		12,298
Coffee	Quantity	Kilos	111,686	1,428	2,510	196	2,141	13		117,974
	Value	Dollars	29,083	341	551	59	557	3		30,594
Cacao	Quantity	Kilos	52,009	15,339	2,516					100,458
	Value	Dollars	12,472	4,009	716					17,197
Eggs	Quantity	Kilos	272,777	39	151					272,967
	Value	Dollars	25,867	2	6					25,875
Raw cotton	Quantity	Kilos								
	Value	Dollars								

EXPORTS.

Hemp	Quantity	Kilos	12,544,423	2,868,113						15,412,536
	Value	Dollars	1,269,471	334,751						1,604,222
Sugar	Quantity	Kilos	7,942,288	6,252	16,331,685					24,280,225
	Value	Dollars	460,293	313	953,372					1,413,978
Copra	Quantity	Kilos	5,263,169	2,099,900		217,431	222,420			7,802,920
	Value	Dollars	418,684	205,840		17,950	19,722			662,196
Cigars	Quantity	Thousands	18,297							18,297
	Value	Dollars	319,739							319,739
Cigarettes	Quantity	Thousands	4,421							4,421
	Value	Dollars	6,187							6,187
All other tobacco	Quantity	Kilos	471,925							471,925
	Value	Dollars	85,118							85,118

THE ILOILO SUGAR MARKET.

By JOSÉ T. FIGUERAS.

MARCH.

The arrivals of sugar in Iloilo from the fields and sugar mills during the month of March amounted to 296,480 piculs.

The market price of 8 pesos and 4 reales [1] at the close of the month of February continued until March 2, when it was quoted at 8 pesos 5 reales; this price continued only to the 4th, when sugar went up to 8 pesos and 6 reales, which quotation prevailed until the 9th, when 9 pesos a picul was offered—the highest price paid during the month. On the 12th the price dropped to 8 pesos and 6 reales again, at which figure it continued until the 21st, when it dropped to 8 pesos 5 reales. On the 28th there was a slight rise to 8 pesos and 6 reales, which continued without change to the close of March.

March shipments.

CROP 1909–10.

Date.	Vessel.	Destination.	Superior (piculs).
March 12	Clan McIver	U. S. via Manila	80,000
March 23	Janeta	San Francisco	97,600
Total for March			177,600

Exports up to March 27 for 1908 and 1909.

[In piculs.]

To—	1908–9 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	70,400		196,000	
Japan	8,000	5,915		
China	373,401		64,575	
Total	451,801	5,915	260,575	

[1] 1 real equals about 12½ centavos.

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

MARCH, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.0	22.3	25.0	6.0	26.4	------	27.4	------	25.7	------	25.8	------
2	24.8	24.4	26.8	2.8	27.1	------	26.4	------	25.7	------	25.9	------
3	26.0	------	26.7	------	27.4	------	28.4	------	24.6	------	26.0	------
4	26.8	------	26.8	------	27.6	------	28.8	18.8	24.6	------	25.4	------
5	27.3	------	26.8	------	27.0	------	28.0	------	23.1	6.6	25.8	------
6	26.0	0.3	26.0	------	26.5	------	29.0	------	24.3	0.5	25.7	------
7	26.8	2.8	25.6	6.9	26.2	3.6	28.6	------	23.4	------	25.9	------
8	25.3	6.9	25.4	15.7	25.4	1.3	27.4	------	24.2	1.0	------	------
9	25.6	17.5	25.2	17.2	26.6	2.0	27.2	1.3	22.5	0.6	26.0	------
10	26.4	------	26.0	------	26.4	------	28.2	15.5	24.0	------	26.6	------
11	26.4	------	25.1	4.1	26.5	0.3	28.2	0.3	23.5	1.3	25.7	------
12	25.3	12.5	24.3	39.6	26.6	------	27.4	------	24.7	------	25.6	------
13	26.2	2.6	25.2	4.5	26.3	------	27.0	------	23.9	------	26.1	21.6
14	25.5	14.7	24.6	1.0	25.9	0.3	27.6	------	24.0	------	26.2	------
15	25.4	0.8	25.3	11.4	25.5	------	26.2	------	24.9	------	26.1	------
16	24.4	62.2	24.4	4.9	25.6	------	27.0	------	24.3	------	26.8	------
17	23.8	104.6	25.7	6.0	25.8	0.3	26.3	------	24.5	3.6	27.2	------
18	25.5	0.3	26.2	19.8	25.7	6.1	28.5	------	23.5	24.0	28.0	------
19	26.5	------	26.6	------	25.9	1.0	28.6	------	24.6	------	28.2	6.4
20	26.6	------	26.6	17.3	26.1	0.3	29.2	9.1	25.1	------	27.4	------
21	27.1	7.6	25.8	3.8	26.4	------	29.1	------	25.9	------	27.0	------
22	26.0	1.3	26.0	1.5	26.4	------	28.6	------	25.5	0.5	28.4	2.3
23	27.0	8.9	26.6	------	26.4	------	29.0	33.5	24.0	8.9	27.4	------
24	27.3	2.8	27.0	1.8	28.1	------	28.6	0.3	24.2	23.4	26.7	7.6
25	27.4	1.8	26.4	0.3	27.5	------	28.6	------	25.9	------	26.6	------
26	26.8	8.6	24.8	13.7	27.1	------	28.3	------	25.9	------	26.7	------
27	27.1	7.8	26.8	1.8	27.3	1.3	27.8	------	25.7	------	26.6	------
28	27.6	2.5	26.5	3.0	27.5	------	27.2	------	25.5	------	25.4	------
29	27.1	17.0	26.9	2.8	27.4	------	27.6	------	26.2	------	26.2	------
30	26.8	2.6	25.5	21.3	27.0	------	26.5	------	26.6	------	26.0	------
31	26.7	18.0	26.1	11.4	27.1	------	28.0	------	26.8	------	27.2	0.8

PLATE I.—A GENERAL VIEW OF THE BAGUIO EXPERIMENT STATION.

THE PHILIPPINE

Agricultural Review

VOL. III JUNE, 1910 No. 6

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EDITORIAL.

DRAFT ANIMALS IN THE PHILIPPINE ISLANDS.

It was manifest to all who were present at the agricultural conferences held during the last Carnival that the subject of draft animals was regarded as a most important problem by the delegates who attended the conferences. As these delegates represented the agricultural interests of a large number of municipalities and provinces, it is certain that this subject is one of vital concern to the agricultural community at large.

It is not difficult for one who is familiar with conditions in these Islands to understand the important place which the draft animal holds in the industrial life of the country. An enormous amount of animal power is required to carry on the agricultural work that is being done, and the available supply of draft animals is by no means equal to the demand. This supply has steadily been reduced from year to year ever since rinderpest was first introduced into the Islands in 1888. The scarcity of draft animals in the early nineties was one of the important causes of the agricultural depression, which resulted in discontent and finally in insurrection against the Spanish Government.

It is a fact clearly recognized by all who have given the subject careful thought that this question of increasing the present supply of draft animals is one of the most important problems that the Government has to solve. Many who are not entirely familiar with the situation often express the opinion that it is a simple matter, and one that requires only the adoption of certain governmental policies. Others appear to believe that animal diseases have become epizoötic in these Islands, and that no amount of effort will ever exterminate them.

The man who is interested in the immediate production of crops or the transportation of supplies is not in a position to wait indefinitely for the final solution of this problem, but imperatively demands that the supply of work animals be increased at once. The need for more work animals is so great and the available means for buying them is so limited that the great majority of farmers in the Islands are never able to purchase enough animals to entirely satisfy their demands. This condition is aggravated by the fact that the prices of live stock are constantly becoming higher and higher. The man who was accustomed to paying from ₱15 to ₱25 for a carabao twenty years ago, is compelled to pay from ₱75 to ₱150 for the same grade of animal at the present time.

As a result of these conditions, numerous suggestions have been offered as to the best means of improving the situation. The most popular of these suggestions is the importation and sale of animals to those who need them for agricultural purposes. The plan frequently advanced is that the Government should import the animals, immunize them against rinderpest, and sell them to the farmers at cost, payment to be made on the installment plan after the animals have been used to produce crops. This method has been tried, has proven to be impracticable, and probably will not be considered again.

The increase of the available supply of work animals that shall meet the current demand, and the consequent restoration of the agricultural industries of the Philippine Islands to their former state of prosperity, will have to come about largely as a result of internal industry and enterprise, although the course necessary to pursue is beset with many difficulties and heavy risks. A satisfactory supply of work animals can only be had when produced in abundance in this country and at prices much lower than the cost at which such animals can be imported. What the Government can do and is doing at a very rapid rate, is to completely eradicate the worst contagious animal diseases, so that investment in herds of cattle and carabaos to be bred and kept on the large unoccupied ranges which are so abundant in the Philippine Islands will prove a safe investment.

An examination of the forest maps of the Islands, prepared by the Bureau of Forestry during the past few years, shows that there are large areas of unoccupied land covered only by grass that are not being used for any purpose whatsoever. Most of these lands are public domain and will not be required for agricultural purposes within the next ten to twenty years. Whenever they lie in isolated localities, such as are found in the Mountain Province, parts of the Cagayan Valley, and in the regions about Sarangani Bay and in Agusan Province in Mindanao, they can be given protection against infection, when once freed from disease, and the cattle industry should naturally go to these places.

Once large herds are established, the available supply of work animals can be brought up to any reasonable limit and the price correspondingly reduced. A single ranching enterprise on the southwest coast of Mindoro recently included a herd of 500 head of cattle and 100 head of horses, all of which were raised at a good profit, and no losses from contagious diseases were sustained on this place for many years. If arrangements could be perfected by which the Government would lease in large areas the unoccupied ranges suitable for stock raising, so as to warrant the equipment and stocking of ranges on a sufficient scale to make it profitable for capital to invest in such enterprises, the draft animal problem would be solved in a very few years.

MR. MERRILL AND THE BAGUIO EXPERIMENT STATION.

One of our leading articles this month is by Mr. M. C. Merrill who, for about two years, has been superintendent of the experiment station maintained by the Bureau of Agriculture near

Baguio. This station was established some eight years ago and has been under the management of several superintendents. Mr. Merrill was at this station a sufficient length of time to thoroughly organize the work, and it is no injustice to the former superintendents of the station to say that he accomplished more while there than any other person who has been in charge. The thoroughly systematic way in which he conducted his experiments is shown by the article which he has prepared on this subject.

Mr. Merrill has resigned his position in the Philippine service and has returned to the United States, where he will take an advanced course at Cornell University. On receiving his doctor's degree, he expects to enter professional work in the United States.

Mr. Merrill came to the Philippines in November, 1906, as an agricultural inspector, and by reason of his energy, careful study of local conditions, and the thorough training which he had received in the United States made rapid advancement. It is a matter of regret that a man whose services were so valuable in the Philippines could not be retained here.

MINUTES OF THE AGRICULTURAL CONFERENCES HELD DURING THE PHILIPPINE CARNIVAL, FEBRUARY 7 TO 10, 1910.

(Continued.)

FEBRUARY 8.

Morning session.—The morning session opened at 9 o'clock, with Professor Conner as presiding officer. Doctor Ocampo opened the discussion with a request that the Bureau of Agriculture publish, in all the various dialects spoken in the Philippines, instructions regarding rinderpest, its origin, symptoms, the stages it passes through, and the best methods of treatment. Doctor Gearhart informed Doctor Ocampo that such information regarding rinderpest and the other infectious animal diseases prevalent in the Islands had been published in English and Spanish in THE PHILIPPINE AGRICULTURAL REVIEW for March, 1908. He further stated that the question of curing rinderpest is much less important than that of preventing it. Isolation of the diseased animals in order to protect the other animals from infection is most necessary, for it is the lack of care in this matter, allowing the diseased animals to mix with healthy animals, that causes the disease to spread. In every case, when an animal is found sick, it should be isolated at once.

Sr. González (J.) suggested that the Government import animals, render them immune to rinderpest, and then sell them to farmers, the payments for such cattle to be made in three installments, for the benefit of those who are not prepared to pay the whole amount at once.

To Sr. González's further suggestion that there be corrals established in all the provincial capitals, to which the owners of cattle might bring their animals and have them immunized (a certain per cent of the expense to be paid by the owners) Professor Conner replied that at present all the men who can be obtained are needed to fight the disease where it already exists, and if it can once be eradicated, no such provincial stations will be necessary.

Sr. Carrillo then asked how many kinds of animal diseases

there are at present in the Philippines, to which Doctor Gearhart replied that there are three important animal diseases—surra, rinderpest, and septicemia. Foot-and-mouth disease also attacks animals, but is not so important as the other three. Sr. Carillo proceeded to describe several diseases of which carabaos and cattle have died, particularly one which he said resembled "smallpox," for which he desired to know the remedies, but as these were not at all prevalent and for the most part noncontagious, the discussion returned to the subject of rinderpest. Sr. Tiangco spoke of the difficulty encountered in obtaining serum promptly, and suggested that large quantities be made and sent to the provinces to be available when it is needed. Doctor Gearhart replied that the Bureau of Agriculture is constantly trying to obtain better facilities for the production of serum and sufficient money for the purchase of animals for this purpose, and is doing everything in its power to increase the amount of serum available for the farmers.

The question of proper care of animals next arose, Sr. Olaguer claiming that many carabaos die from lack of attention and proper food. It was stated that many animals after working all day are merely turned loose at night, without sufficient food to strengthen them, and are worked again the next day. Many of the carabaos are naturally inferior and susceptible to disease because they are born of parents weakened by this same lack of care. It appeared that an unusually large number of young carabaos are dying. It is most necessary that only good healthy animals should be allowed to produce young.

Sr. Cruz then spoke of the need in the provinces for instruction regarding the diseases attacking animals. He suggested that the veterinarians in charge in the various provinces be instructed to hold popular conferences from time to time, as need arises, when the different diseases found in the towns of the province can be discussed and suggestions given for treatment. Doctor Gearhart stated in reply that the Bureau of Agriculture would be most willing to coöperate in any such undertaking, and he recommended that the delegates present use their influence with the people in the provinces to encourage this idea. It was further suggested that the Filipino school-teachers, with their knowledge of English and understanding the conditions in their provinces, might be used in connection with the conferences.

The necessity for improving the quantity and quality of work animals in the Islands by means of better feeding methods was then touched upon, and the stationing of male animals at the various Bureau of Agriculture stations for breeding purposes

was mentioned, with recommendation that this practice be extended to the northern provinces.

At this point Professor Conner introduced the subject of the proposed trip to Alabang, where the production of serum could be observed in detail by the delegates who were interested in this subject, and arrangements were made for a trip to this place on the morning of February 11.

There was a great deal of interest manifested in the subject of animal diseases, and a number of the delegates wished to prolong the discussion of them, but as the time allotted for this purpose was more than over, the presiding officer recommended that any further points or questions on the subject be put in writing and addressed to the secretary, who would refer them to the proper officials for answer.

Mr. Saleeby's address on abacá then followed, after which there was some discussion of this and allied subjects.

Sr. Zamora inquired as to whether the presence of large trees on a plantation is not prejudicial to small plants, to which Mr. Saleeby replied that, as a rule, no trees should be left on a plantation that are not needed for shade or protection of the abacá from strong winds, but that leguminous trees can be left without danger, because instead of rendering the soil poor, this order of plants enriches it. *Pithecolobium saman* (Benth.) and acacia were spoken of as desirable trees for such purposes. When asked whether the roots of these larger trees did not interfere with those of the young abacá, Mr. Saleeby stated that the abacá roots rarely penetrate beyond a depth of 3 feet, while the roots of larger trees usually go deeper. However, in the case of leguminous trees, whose roots are the means through which nitrogen is deposited in the soil, the roots lying near enough to the surface to interfere with the abacá roots would probably prove helpful, by placing within the reach of the abaca plant the nitrogen which it needs. Nonleguminous trees, with deep-growing roots and small leaves, can be used as shade trees without interfering much with the growth of the plants. Sr. Tempongko asked if shade is necessary for the growth of abacá, or whether it would do as well without shelter, if irrigated sufficiently. Mr. Saleeby replied that shade trees serve two purposes. They not only keep the ground moist, but also protect the abacá plants from destructive winds, and that all plantations located within the typhoon belt should be supplied with shade trees unless protected by natural barriers. As for irrigation, he said that it has been proved beyond doubt that it increases considerably the output and the life of the plant, although it is

not commonly applied. Shade trees serve to keep the soil fairly moist during short dry spells, but in a plantation that is naturally protected, and on which irrigation is possible, shade trees become unnecessary.

Asked if the life of an abacá plantation (stated by Mr. Saleeby to be from twelve to twenty years) might be prolonged by the aid of fertilizers, Mr. Saleeby replied that the use of fertilizer in the ordinary sense is not yet known in abacá cultivation, but that he believes that the period of growth might be considerably prolonged by taking special care in cultivation, and being especially careful in harvesting not to injure the mother plant. Often in harvesting the plant, water collects in the top of the stump and decay begins. This condition naturally affects the young suckers and causes them to rot also. A great many plants are destroyed in this way. As already stated, regular irrigation, special care in harvesting, and proper cleaning, etc., are the means by which the life of an abacá plantation may be lengthened. Often after the plantation is several years old the stalks in the hills will become separated in such a way as to leave a space in the center of the hill, which is usually filled with the woody remains of root stocks of the old stalks and other decayed organic matter. This material becomes the breeding place for insects and other harmful things. To remedy this state of affairs, as soon as the hill shows a tendency to spread out, all this decomposed matter should be removed and replaced by new soil. This operation induces the root stocks to send out new suckers on the inside as well as the outside of the hill, prevents the breeding of insects and disease, and gives more compactness to the abacá hill.

The making of pulp for paper from abacá waste was next discussed at some length. Sr. Madrigal asked whether the abacá stalk, when dried, will yield the same quality of fiber as the waste after stripping. Mr. Saleeby believed that it would be doubtful, and suggested that the difficulty lay in the fleshy part of the stalk, which interferes with the reduction of the fiber to paper pulp. Sr. Madrigal suggested that the stalk might be passed through a mill in order to crush the fleshy part, but Mr. Saleeby stated that it would be difficult to separate the fleshy from the fibrous part in this manner. If the abacá were to be taken apart, sheath by sheath, and the fleshy portion of each sheath removed, the cost would be more than the amount received for the product.

The use of machinery in stripping abacá was spoken of as the only solution of the labor problem in many places. It was

brought out that many people were not able to buy the machines, and the advisability of coöperating, a number of planters putting their money into one large machine, was mentioned.

After some further general discussion and announcements, a committee was appointed by the president to receive and arrange in order any resolutions or suggestions which the various delegates might wish to bring before the conferences, so that needless repetition might be avoided and time saved. Doctors Liongson and Ocampo and Sr. Sandiko were chosen to serve on this committee, after which the conference adjoined until 2.30 p. m.

Afternoon session.—The afternoon session opened at 3 p. m. with Professor Conner again in the chair. Doctor Freer was to have addressed the conference at this time on the production of sugar in the Philippines, but as he was not present Professor Conner requested Mr. Prentiss to make some remarks on the subject. He spoke as follows:

Regarding the cultivation of sugar cane in the Philippines I can tell you very little, but I can, perhaps, tell you something about the cultivation of this plant in Cuba or in the United States, as well as some of the defects observed in the cultivation of sugar cane in the Philippines. For instance, I have remarked that here they set the rows of plants very near to each other, while in the United States they set them at a distance of 5½ feet apart, and in Cuba sometimes they set the plants at 10 feet in the old lands. In the cutting of the cane, I saw in Negros that they do not cut level with the ground, but at a certain height above, while in Cuba the cutting is made level with the ground. By doing so, you succeed in saving what we call rattoons, or the second crop of the same planting, so that in virgin land it is possible to do this for ten years without having to plant again. In plowing the land in the Philippines, also, the planters do not penetrate deeply enough. In the old soils in Louisiana, for instance, the following methods are used: The cane is planted, and the second year the planters grow what we call rattoons; that is to say, the crop which springs from the mother plant; and when this is four years old, they cultivate the land by planting leguminous plants, such as cow peas or sitao, which bring up a certain amount of nitrogen from the subsoil, giving it back the fertility it had lost.

In regard to the making of sugar there is also a great difference, since in the United States the cane juice is boiled under vacuum, and centrifugal machines are used, by which method a better quality of sugar is obtained. I fear that the sugar which is made to-day in the Philippines will not be easily sold in the United States, inasmuch as sugar of 96 degrees test gives about 95 per cent of refined sugar; that of 92 degrees test gives 85 per cent, and that of 83 or 84 degrees test only 70 per cent, so that the makers of sugar have no interest in buying the inferior qualities. I think the sugar makers in the Philippines ought to form associations in order to establish a few central sugar plantations where sugar may be made that will polarize at 96 degrees.

With the mills now existing in the Philippines I suppose that only 60

per cent of juice is obtained, while in the up-to-date mills it is possible to obtain 75 per cent or more of juice, compared with the weight of the sugar cane. I think also that in the Philippines it is not possible to get more than 75 per cent recovery from the juice, while with modern machinery one obtains 90 per cent of the percentage of sucrose contained in the cane juice. In the United States the sugar cane is taken to the sugar house in wagons and is unloaded by mechanical means on the carrier, which takes it directly to the mills. From here the juice goes at once to the liming tanks and from these to the heater, in which the heat rises to 230°. From the heater it passes to the defecators or settling tanks. After settling it goes to the evaporators and from there to the vacuum pans, from here to the centrifugal machines and finally to the packing bags.

If you wish to ask any questions I shall take much pleasure in giving you all the information within my power.

Doctor Liongson asked whether soil conditions would influence the polarization tests, since sugar cane from Iloilo which was planted in Pampanga, and submitted to the same treatment and system of boiling, failed to yield the same degree of polarization as in Iloilo. Mr. Prentiss replied that polarization would not be influenced by the properties of the soil, but that much depended on the treatment of the cane and the methods employed in boiling the juice. He suggested that the quality of lime used in Pampanga might differ from that used in Iloilo, and said that in Louisiana the planters often had trouble in this connection; in one instance, when too much lime was used, they used phosphoric acid to reduce the juice to normal condition, which resulted in a very white sugar. Mr. Prentiss said that he considered centrifugal machines necessary in order to get a proper degree of polarization.

Doctor Freer then delivered an address in English on "Production of sugar in the Philippines." After some remarks of a general nature, Mr. John S. Hord delivered an address on the "Cultivation of tobacco in the Philippines" (which has already been published in the REVIEW for April of this year).

There were a few general remarks at the end of Mr. Hord's address, and the meeting closed for the day.

THE BAGUIO EXPERIMENT STATION.

By. M. C. Merrill.

INTRODUCTION.

Location.—The Baguio experiment station is located in the tops of the mountains of north-central Luzon at an altitude of approximately 1,500 meters. Baguio is a town the name of which is known from one end of the Philippines to the other, and it is about 5 kilometers north of Baguio, in a basin having very much the appearance of an old crater, that the station is situated. This crater-like basin is known as the Trinidad Valley. The valley's perimeter is more or less circular and its diameter is about 3 kilometers.

Soil and irrigation.—The soil of the valley, according to mechanical analyses that have been made, is composed largely of fine sand, silt, and clay, and, under the classification adopted by the Bureau of Soils of the United States Department of Agriculture, is classified as a fine sandy loam and loam, with a subsoil ranging from loam to clay loam. The soil on the whole is rather poor in available plant food, thus requiring the use of manures and commercial fertilizers for the satisfactory growth and production of the various crops grown at the station. During the dry season, from November to March, irrigation is carried on, not only at the station, but also on the Igorot rice farms throughout the valley.

Climate.—The rainfall at Baguio during the fiscal year from July 1, 1908, to June 30, 1909, was quite excessive, 185 inches (470 centimeters) having fallen during that time. Nearly three-fourths of that amount fell during the first third of the year, the precipitation from the first of November to the last of June being 52.22 inches (132.64 centimeters). The temperature in this region is delightfully pleasant the year round and is the chief reason for the establishment of the summer capital at Baguio. The maximum temperature during the year referred

to occurred on December, 1908, and was 30.5° C.; the minimum occurred on January 14, 1909, and was 9.0° C. During the greater part of the year, however, the day and night variation of temperature ranged comfortably between 15° and 25° C.

GENERAL WORK OF STATION.

Classification.—The general work carried on at the station may be classified under four heads, namely:

(1) Investigational, or experimental.

(2) Distribution of home-grown and imported seeds and plants.

(3) Growing of crops for demonstration purposes.

(4) Commercial crop growing, or the production of vegetables, fruits, and flowers for sale, and of forage for feeding the station animals and those at the stock farm.

Reason for growing vegetables at station.—Because of the scarcity of vegetable growers in the country round about Baguio, the Government a few years ago undertook the work of growing vegetables to supply the demand for such, and it has continued doing so ever since. It is hoped that the Government will be relieved of this phase of the station's work before long, and just as soon as there are sufficient private growers engaged in this work to supply the demand the station will cease growing vegetables and fruit for commercial purposes, and its management will then be at liberty to devote more of its time and energy to purely experimental work.

Scope of this article.—As numerous inquiries have been made regarding the various phases of the work of growing vegetables and fruit for the Baguio market, the main purpose of this article is to answer a few of those inquiries by submitting herewith some of the results obtained in this line of work at the station during the fiscal year referred to. This article therefore deals with only that phase of the station's work coming under division No. 4 in the classification given above, and more particularly with that part of it which pertains to the products sold to Baguio buyers. The local conditions as to temperature, rainfall, soil, and irrigation, described in the introduction, should also be kept in mind when considering any of the statements or data given below.

Data and records kept.—Accurate and reliable data were kept during the year on the following points:

(1) Dates of arrival of seeds or plants at station and whence obtained.

(2) Germination tests of all varieties.

(3) Area, dates, and varieties planted.

(4) Method and rate of planting.

(5) Kind and amount of fertilizers applied and dates of application.

(6) Dates of cultivating each plat.

(7) Dates of irrigating each plat.

(8) Dates of weeding each plat.

(9) First and last date of harvest.

(10) Total yield of each plat and of each variety.

(11) Total cash sales of each crop.

(12) Total and exact cost of manual labor expended on each crop for plowing, disking, harrowing, leveling, and preparing the plats for planting; for planting the seeds, fertilizing, irrigating, cultivating, weeding, and harvesting the crop. (It should be noted that the work done by the station "vacas" and mules, the delivering of the produce to Baguio, and the cost of superintending the work were not included in the cost of labor for any of the crops.)

(13) Crop notes showing vigor and characteristics of growth, comparison of varieties, health and size of plants, insect pests, and plant diseases.

The foregoing data are all written up in triplicate on forms supplied by the Bureau of Agriculture, and may at any time be studied in detail by those interested by calling at the office of the Director in Manila or at the station at Baguio.

The data included in this article.—It is manifestly impossible to give all the above-named data in an article of this kind, the length of which must be kept within reasonable limits. Only those items are included in the table below, therefore, which are believed to be of most interest to the general reader, as well as to those engaged in vegetable gardening.

Table showing plantings, yields, sales, cost of labor, etc.

Crop.	No. of varieties.	First and last date planted.	Total area planted.	First and last date of harvest.	Total yield.		Selling price.	Total cash sales.	Cost of labor.
					Kilos.	Other units.			
			Hectares.						
Beans	5	Jan. 9 – Apr. 13	0.66	Mar. 9 – June 30	1,710.01		₱0.25 a kilo	₱364.39	₱107.53
Beets	2	Dec. 31 – Feb. 6	.10	Feb. 13 – June 28	313.31	583 bunches	0.20 a bunch	97.85	26.25
Beet greens					41.35		0.20 a kilo	7.74	
Brussels sprouts	2	Feb. 24	.032	June 16 – June 28	16.15		0.50 a kilo	5.20	5.31
Cabbage	3	Jan. 28 – Jan. 29	.079	Apr. 17 – June 16	1,281.6	1,036 heads	0.20 a head	177.60	15.74
Carrots	3	Dec. 31 – Feb. 5	.067	Apr. 12 – June 23	167.94	168 bunches	0.20 a bunch	24.90	11.10
Cauliflower	3	Feb. 9 – Feb. 10	.080	May 17 – June 5	3.81	32 heads	0.20 a head	3.20	16.25
Celery	3	Mar. 27 – Mar. 29	.072	June 10 – June 30	55.94	673 plants	0.10 a bunch	36.95	23.09
Collards	1	Jan. 29	.034	Apr. 1 – June 30	582.89	7,829 leaves	0.10 a bunch	8.80	4.68
Swiss chard	1	Dec. 31 – Feb. 23	.034	Mar. 30 – May 24	104.25		0.20 a kilo	24.00	3.41
Sweet corn	3	Jan. 15 – Feb. 12	.28	Apr. 14 – June 8	337.32	2,327 ears	0.50 a dozen	70.00	19.76
Cucumbers	2	Jan. 22	.12	Apr. 9 – May 19	200.39	1,681	0.03 each	42.90	7.00
Eggplant	3	Feb. 24 – Feb. 25	.052	May 11 – June 25	14.25	134	0.05 each	5.20	6.08
Endive	1	Mar. 10	.017	May 29 – June 26	20.7		0.50 a kilo	8.55	1.12
Husk tomato	2	Feb. 19 – Mar. 8	.11	June 14 – June 30	40.15		0.10–0.20 a kilo	4.00	20.67
Kale	3	Feb. 5	.025	May 11 – June 30	187.78	5,590 leaves	0.10 a bunch	4.20	4.28
Kohlrabi	2	Jan. 6 – Jan. 7	.053	Mar. 9 – May 28	117.34	1,053	0.40 a dozen	24.95	9.22
Lettuce	4	Jan. 6 – May 11	.11	May 8 – June 25	23.87		0.50 a kilo	10.83	12.72
Onions	3	Jan. 2 – Feb. 23	.068	Apr. 19 – June 11	2.91	511 plants	0.20 a bunch	4.00	6.68

Parsley	3	June 3[a] – Feb. 5[b]	.006	Feb. 25 – June 30	5.20	130 bunches	0.10 a bunch	10.69	0.62
Parsnips	3	Dec. 31 – Feb. 5	.097	June 7 – June 28	19.84	66 plants	0.20 a bunch	2.20	8.69
Peas	4	Nov. 30 – Mar. 24	.61	Feb. 8 – June 7	1,263.91		0.25 a kilo	289.20	130.15
Pepper	5	Mar. 2 – Apr. 20	.084	June 10 – June 25	16.30		0.50 a kilo	10.20	13.75
Pumpkins	3	Jan. 21 – Feb. 12	.30	May 3 – May 28	980.94	675	0.05 a kilo	0.83	14.06
Radishes	3	Dec. 30 – Apr. 10	.11	Jan. 29 – May 25	586.55	4,642 bunches	0.05 a bunch	137.75	27.25
Salsify	2	Dec. 31 – Feb. 6	.064	Apr. 12 – June 28	113.22	154 bunches	0.20 a bunch	26.80	8.76
Spinach	3	Jan. 6 – Feb. 23	.089	[c]	[c]		0.20 a kilo	24.28	7.34
Squash	4	Jan. 21	.18	Mar. 28 – May 18	1,224.2	1,870	0.10 a kilo	67.66	13.73
Tomato	8	Jan. 22 – Mar. 6	.70	Apr. 26 – June 28	1,334.24		0.10–0.25 a kilo	212.30	110.27
Turnips	5	Dec. 30 – Apr. 10	.31	Feb. 13	1,141.5	1,535 bunches	0.10 a bunch	131.95	47.98
Turnip greens				June 28	9.3		0.20 a kilo	1.80	
Asparagus	[c]	[c]	.072	Mar. 20 – May 15	11.41		0.50 a kilo	5.40	17.07
Horse-radish	[c]	[c]	.006	May 14 – June 30	4.07		0.05 a bunch	4.35	2.32
Huckleberries	[c]	[c]	.010	Apr. 19 – June 21	1.84		1.00 a kilo	0.32	3.13
Mulberries	[c]	[c]	.20	Dec. 12 – June 29	164.47		1.10 a kilo	136.07	64.65
Strawberries	2	Aug. 28 – June 10	.45	Dec. 21 – June 30	237.13		2.20 a kilo	483.06	246.96

[a] 1908. [b] 1909. [c] See following notes.

GENERAL NOTES REGARDING CROPS IN ABOVE TABLE.

Planting and cultivation.—All of the crops given in the above table were planted in rows 9 to 12 decimeters apart, except cucurbits—cucumbers, pumpkins, squash—which were planted in hills 12 and 24 decimeters apart each way, depending on the kind and variety. All crops were cultivated by spike-tooth horse cultivators from two to eighteen times during the year, the number of times varying according to the length of the growing season, as well as to the time of planting. The use of horse cultivators was decidedly beneficial and economical in that it very greatly reduced the amount of hand labor needed to keep down the native weeds and grasses, and also conserved the soil moisture, thus reducing the number of times irrigation was necessary and thereby saving a considerable expense of labor for that work.

Regarding the cost of production.—In comparing the figures in the last two columns of the table, it should be borne in mind that the difference there apparent does not represent the actual gain or loss in each case, as the cost of seeds, and especially of commercial fertilizers, varying kinds and amounts of which were used on all the crops given in the table, would need to be added to the cost of labor to get the approximate cost of production. What was said in a preceding paragraph regarding the cost of labor should also be noted in this connection.

Dates of transplanting.—The dates of planting of Brussels sprouts, cabbage, cauliflower, celery, collards, eggplant, husk tomatoes, the lettuce planted May 11, pepper, and tomatoes, given in the table, are the dates when those crops were transplanted to the field, i. e., the first and last dates of such transplanting. The seeds of all those crops were planted in the open seed bed or in flats in the greenhouse from three and one-half to seven weeks earlier in all cases except the celery, which was eleven weeks earlier. Some of the crops were transplanted once before being set out in the field.

When and whence seeds were received.—Most of the seeds planted during the year were received from Thorburn & Co., New York, although a few for the later plantings of some of the crops came from Australia. The season's planting should have commenced in November, but owing to the fact that the seeds did not arrive at the station until December 27 the planting for the year was correspondingly delayed. As a result, some of the crops did not produce their harvest until the rains had set in, which adversely affected both the quantity and quality of the yield. For brief statements as to the damage done in each case see the specific notes below.

Insects pests and plant diseases.—All orders of insects are to be found about the station, and the keeping of a sharp lookout for their ravages and the immediate and intelligent application of remedies therefor are important factors in the successful production of vegetables, fruits, and other crops. The insects causing most trouble during the year were the following: The "lady-bird sinners" (*Epilachne*), which attacked the Irish potatoes; one of the *Rhynchophora*, which deflowered hundreds of rose bushes and also ate some of the young sweet-corn plants; cutworms of various kinds, which almost destroyed the cauliflower crop by eating off the young plants immediately after they were set out, and which also did a great amount of damage in the same way to the eggplant, Brussels sprouts, and kohlrabi crops. Cabbage, beets, carrots, and turnips were crops that were also damaged to some extent by cutworms. Hand picking, spraying with Paris-green mixture, and applying poisoned bran mash were the principal remedies

adopted. The last named was used only against the cutworms, but its use for that purpose was attended with gratifying results.

Blight, anthracnose, and nematodes, affecting the Irish potatoes, beans, and tomatoes, respectively, were the diseases that caused most damage during the year. In the case of the beans and tomatoes, however, the area planted was so large and the harvest so abundant that the loss of a portion of it by disease was not a very serious matter.

Weighings and size of bunches.—Twelve plants made one bunch of each of the following: Beets, carrots, onions, radishes, salsify, and turnips, and all weighings of the yield of these crops included the tops. Six parsnip plants made one bunch, tops included in weights. A bunch of each of the remaining crops sold by bunches was as follows: Celery, 1, 2, or 3 plants; collards and kale, each 6 leaves; parsley, 6 stems; horse-radish, 1 root ordinarily gave from three to five bunches.

SPECIFIC NOTES REGARDING CROPS IN THE TABLE.

In the following notes each crop is considered separately. The names of the varieties planted are given, and very brief statements are made regarding some of the conditions under which the crops were grown, the results obtained, and other miscellaneous data.

Beans.—Canadian Wonder, Improved Dwarf Golden Wax, Henderson's Bush Lima, Navy, and Warwick. All plantings of beans made during the forepart of season did splendidly, the harvest being large and the quality fine. During the time of frequent showers from April to the end of the year (June 30), the effects of anthracnose began to be very pronounced, and, as a result, dozens and dozens of kilos of beans were discarded as culls after having been harvested and weighed. The anthracnose became so bad toward the close of the year that the harvest of the later plantings was extremely light and so badly affected that some plats were not harvested at all. These facts should be borne in mind in noting the total yield on the area planted.

Beets.—Crimson Globe, Eclipse. Both varieties did only fairly well. Average size of beets harvested was small—about 3.5 centimeters in diameter—but they were tender, crisp, and of excellent flavor.

Brussels sprouts.—Improved Dwarf German, Long Island. Plantings made too late. Harvest therefore small and sprouts inferior because of rainy weather.

Cabbage.—Charleston Wakefield, Improved Early Summer, Newark Flat Dutch. All varieties did splendidly and produced heads that were firm and sound and of fair size and excellent quality.

Carrots.—Half-Long Danvers, Long Orange, Oxheart. All varieties germinated poorly in the plats and crop was correspondingly thin.

Cauliflower.—Extra Early Paris, Large Algiers, Thorburn's Extra Early Snowball. Crop little better than a failure because of cutworms and wet weather before heads matured. Should have been planted earlier in order to avoid the rainy season.

Celery.—Giant Pascal, Improved White Plume, Pink Plume. Planted too late for best results. A considerable amount still unharvested on June 30, and hence not included in the total yield given in the table.

Collards.—Georgia. Grew luxuriantly and produced abundance of leaves, nearly all of which were fed to the station "vacas." Excellent for that purpose, as they are greatly relished by those animals. Not all harvested

by June 30, on which date thousands of leaves were still on the plants and new leaves still growing. Hence the figures in the table represent only part of the total yield of collards.

Swiss chard.—Seeds on more than half of the area given in the table failed entirely to germinate. Two plantings were made—on December 31 and February 23. The first planting grew fairly well, but the seeds of the last planting were the ones which entirely failed to germinate. The total yield was therefore obtained from less than half of the area given in the table.

Sweet corn.—Crosby Sugar, Early Adams, White Evergreen Sugar. But two plantings made. The later one—on February 12—gave somewhat better results than the first planting, the plants being larger, more vigorous, and more numerous on a given area. A higher and more uniform temperature during the growth of the second planting is believed to have partly accounted for the difference. The average size of the ears of all varieties, however, was a trifle less on the second than on the first planting. A considerable part of the ears of all varieties on both plantings were unsalable culls.

Cucumbers.—Early Russian, White Spine. The Early Russian germinated far more poorly than the White Spine, the yield of the first-named variety being correspondingly poorer. The fruit of the Early Russian is also considerably smaller than that of the White Spine.

Eggplant.—Black Beauty, Black Pekin, Early Dwarf Purple. Planted too late. Plants and fruit badly damaged by rains, which greatly reduced the harvest.

Endive.—Old seeds on hand at station. Grew nicely. Only small part harvested by June 30, due to late planting.

Husk tomato.—Cape Gooseberry, Ground Cherry. Plants grew vigorously, especially the Cape Gooseberries. Abundant harvest produced. Fruit splendid for making preserves or pickles, or for eating raw or cooked. Because of late planting, however, only a very small part of the crop was harvested prior to June 30. The Cape Gooseberries sold for ₱0.20 a kilo, while the Ground Cherries sold for ₱0.10 a kilo.

Kale.—Curled Dwarf, Green Scotch, Dwarf Brown Curled, Thorburn's Improved Siberian. All varieties did fairly well. Very little of the product sold. Nearly all of the crop fed to station "vacas," which greatly relished the leaves. Not all of the crop harvested by June 30.

Kohlrabi.—Purple Vienna, White Vienna. Germinated poorly, but the crop nevertheless a fair success. A considerable number of unsalable culls produced, however.

Lettuce.—Big Boston, Black Seeded Simpson, Hanson, and one variety the name of which is not known. First planting a total failure, second planting but little better, due to failure of seeds to germinate. Both plantings made directly in the plats. The third planting made in flats in the greenhouse on April 1, plants transplanted to other flats in the greenhouse on April 20 and 21, and transplanted out in the plat on May 11. This method gave far better returns than by planting the seeds directly in the plats. At the time of transplanting to the plat on May 11, however, the rains were so frequent and heavy that the plants failed to do well.

Onions.—Large Red Globe, Prizetaker, Red Bermuda. Seeds planted directly in the plats. Germinated extremely poorly, and even the few plants that came up failed to grow well. It is believed that better results could

be obtained by planting the seeds in the greenhouse or a seed bed first and later transplanting the seedlings to the plats.

Parsley.—Extra Double Curled, Fern Leaf, and one variety planted before June 3, 1908, the name of which is not known. All the parsley sold during the year was obtained from a few plants raised from seed planted prior to June 3, 1908. No harvest was made from the February 5 planting, although the varieties both grew steadily from the start and became good-sized plants by June 30.

Parsnips.—Hollow Crown, Long White, Student. Germinated so very poorly that harvest was almost nil. Some parsnips were still unharvested on June 30, however.

Peas.—First-of-All, White Marrowfat, and a variety believed to be Telephone. Early plantings grew luxuriantly and produced abundant harvest. Later plantings affected by rains, which decreased the yield almost to nothing.

Pepper.—Chinese Giant, Golden Bell, Ruby King, "Picantes Blancos," "Picantes Morados." Fairly good results were obtained with the first three varieties, all of them bearing a considerable quantity of fruit of good size and quality. Only about half the crop was harvested prior to June 30. The last two varieties were obtained from the Iwahig penal colony. Because of being planted so late in the season, however, these varieties produced no fruit. It appears in the table that more pepper was sold than was harvested. This is due to the fact that a small portion of the previous year's crop was sold after July 1, 1908, the sales being included in this year's account, but the yield of that crop not included.

Pumpkins.—Connecticut Field, Early Sugar, Golden Oblong. Vigorous growth, good yield, excellent quality. Almost all of the pumpkins were fed to the station animals. A considerable amount of seeds of all varieties saved for distribution and future plantings.

Radishes.—Crimson Giant, Early Scarlet Turnip, French Breakfast. All rapid, vigorous growers. Abundant harvest produced. One plat produced two crops during the season. A few rows of radishes planted to mark the rows of slower growing crops. Excellent for this purpose.

Salsify.—Long White French, Mammoth Sandwich Islands. Crop on the whole a fair success. Some plants of the later planting still unharvested on June 30.

Spinach.—Bloomsdale, Long Standing, New Zealand. All the spinach, the seeds of which were regularly planted, was a total failure, due to the seeds germinating so very poorly or not at all. Some New Zealand spinach was grown at the station the previous year, however, and this had gone to seed. As a consequence, volunteer plants came up in various places. These were allowed to grow and from these plants our harvest for the year was gathered, and sales made accordingly.

Squash.—English Vegetable Marrow, Summer Crookneck, White Bush Scalloped, Hubbard. Good results obtained with all varieties.

Tomato.—Acme, Lorillard, Stone, and five small varieties, the seeds of which were saved the previous year. The harvest abundant and the fruit excellent. The supply greater than the demand and hence hundreds and hundreds of kilos of tomatoes ripened and rotted on the vines. Could the plantings have been made earlier all of the harvest would no doubt have been sold because of the numbers of people then in Baguio. But the tomatoes did not ripen sufficiently early to supply the demand of those in Baguio

during the greater part of the season. The first three varieties sold for ₱0.25 a kilo; the small varieties for ₱0.10 a kilo.

Turnips.—Early Snowball, Half-Long White, Teltow, Early Dutch, and one unknown variety. Several plats planted. One plat produced two crops of turnips. Fair results obtained on the whole. Not all of the crop harvested on June 30, and hence that part of the crop was not included in the total yield given in the table.

Asparagus.—Variety not known. Planted prior to 1908. Tops cut off March 15 and sprouts harvested for sixty days. Sprouts rather small, but it is believed both quality and size will improve in coming years.

Horse-radish.—Growing promisingly, having been planted prior to 1908. When roots are harvested, the tops are replanted. Variety not known.

Huckleberries.—A few native plants obtained from the near-by hills and set out in one of the plats to determine if domestication would improve the quality and increase the size of the fruit.

Mulberries.—Several varieties—white, black, etc.—growing here and pruned each year in such a way as to induce fruiting. The plants began bearing for the year on December 12 and continued doing so almost incessantly until June 30.

Strawberries.—Reine de Prairie and a Chinese variety. The Reine de Prairie variety grew rankly, sent out an abundance of leaves, and became a dense, compact plant, but it is a poor bearer, and the berries are small in size, cylindrical in shape, very soft in texture, and only mildly acid in flavor. This variety began bearing on January 21 and continued doing so unceasingly until May 29. The Chinese strawberry grown here has several excellent characteristics—the fruit is large, luscious, and firm, and the plant a most prolific bearer. This variety commenced bearing for the year on December 21 and kept on steadily until June 30. The Reine de Prairie strawberries in one of the plats containing 457 square meters were dug out and another planting of Chinese strawberries made therein on June 10, 1909. This second planting did not bear before June 30, however, and the 457 square meters should therefore be subtracted from the area given in the table to get only the area which bore fruit, because as regards the total area planted the second planting was considered the same as if it had been an original one. The process of replacing the Reine de Prairie strawberries with the Chinese variety is being carried on at the station, and it is hoped soon to have sufficient of this kind to supply all the demand.

NOTES ON SUGAR-CANE GROWING IN HAWAII AND THE SOUTHERN UNITED STATES.

By Dr. G. E. Nesom,
Director of Agriculture.

Location of plantations.—Sugar cultivation in the southern United States extends from North Carolina along an irregular line running southwest through Tennessee, Arkansas, and Texas to the Rio Grande. Nearly all of the commercial sugar is produced in Louisiana and southeastern Texas. Table sirup, however, is produced in commercial quantities in other portions of the South. In Hawaii sugar is grown in the coastal plains and foothills, wherever there is sufficient rain or where water for irrigation may be had.

Climate.—In the Hawaiian Islands the climate is tropical, with the temperature ranging from 4° to 5° C. lower than in the Philippines, and with very irregular rainfall. The range of yearly rainfall is from 0 to 1,100 centimeters (400 inches). In Louisiana the climate is temperate, with occasional freezes, and the rainfall amounts to from 100 to 150 centimeters (40 to 60 inches). In southeastern Texas the climate is almost arid. In general it is semitropical, with occasional frosts.

Soil.—The soil in Hawaii is irregular, broken, and volcanic, varying from steep, rugged lava flows to adobe lands and shallow alluvial deposits. The area under sugar cultivation is about 40,000 hectares. In Louisiana the soils used for sugar cane are the deep, black, rich alluvial deposits along the Mississippi River.

Planting.—Planting is done at any time during the year in Hawaii, but the latter half of the year is preferred. The method of planting employed is to lay the points of the mature cane and whole stalks of immature cane horizontally in furrows, the rows being $1\frac{1}{2}$ to 2 meters apart. In Louisiana, however, the practice is very different. Planting is done in the fall of the year, during the grinding season, usually in November, and it is necessary to plant deeply to avoid freezing. Part of the dirt

covering is removed after the coldest weather (as a rule in February) to permit germination. *Seed cane* is also placed in banks and covered with earth to prevent freezing during the winter. It is planted in the spring and germinates at once.

Cultivation.—In the arid portion of the Hawaiian Islands the land is broken deeply with large steam cable plows, and there is practically no cultivation given after the planting. In districts where there is an abundance of rain and in rough country the lands are broken with mule plows. There are a number of small areas on steep hillsides which are rented to Japanese, and these are dug up by hand. In Louisiana most of the lands are broken and the cane is cultivated by means of modern implements drawn by heavy mule teams. Here the stubble left after cutting the cane receives especial care.

Irrigation.—Irrigation is very generally practiced in the Hawaiian Islands in arid sections and where there is a dry season of any considerable length. The water for irrigation purposes is taken from streams, storage reservoirs, and wells. In Louisiana there is but little irrigation, while in Texas a great deal is necessary. The principal source of the water supply in Texas is the Rio Grande.

Fertilizing.—Heavy applications of fertilizers are made on nearly all plantations in Hawaii, the cost amounting to as much as ₱200 per hectare for each crop. Complete fertilizers are used, and as a rule heavy applications of nitrogen are also made at short intervals. In Louisiana there is but little use of fertilizers.

Harvesting.—In both the Hawaiian Islands and Louisiana the cane is stripped with knives, topped, cut down and thrown into piles. It is not thoroughly cleaned, as there is no serious objection to 2 or 3 per cent of fodder, and it increases the fuel.

Transportation.—Railways are in very general use on large plantations in both Hawaii and the Southern States. In Hawaii the tendency is to lay permanent lines to the principal parts of the fields, so that the cane can be loaded directly upon the cars by hand. Fluming, or the transportation of cane from the field to the mill by means of flumes, is very generally practiced in Hawaii in locations where the country is rugged and the rainfall heavy. It would be quite too expensive to pump water enough for the flumes.

In Louisiana barges are used in the rivers, canals, and bayous to a limited extent. The use of wagons and carts drawn by animals is rapidly decreasing, except for very short hauls.

Yield.—In general the heaviest yields of sugar cane per hectare are obtained from the plantations in arid localities having abundant irrigation and using heavy applications of fertilizer. On some of the plantations near Honolulu the yield is as high as 150 metric tons per hectare.

Milling.—Modern sugar mills have from nine to fifteen rollers about 80 centimeters in diameter and 2½ meters long. The cane is weighed on the cars and dumped into a moving carrier, which brings it into the mill and feeds it into the crusher, which consists of corrugated rollers placed just in front of the first mill rollers. After passing through the mill rollers the bagasse is taken by chain carrier to the boilers, where it is fed directly into the furnaces.

Evaporation and later processes.—The juice goes first to liming tanks, where it is treated to correct acidity, and then it is sent in turn to the juice heater, the settling tank, the multiple-effect evaporators, and to the vacuum pan.

From the vacuum pan the juice is passed to the crystallizers, which may be either plain coolers or arranged to keep it in motion. The resulting sugar is freed from molasses and the washing water by "centrifugals," which are rapidly revolving machines holding about 100 kilos of sugar.

The Hersey driers, which are in general use for the final drying of sugar, consist of a revolving iron shell heated by means of a steam coil placed at one end, and with a blast fan to drive the hot air through it.

Molasses.—"Massecuite" and Iloilo sugar are composed of about four or five parts sugar and one part molasses. In Hawaii molasses is generally worked to a low degree of purity and then thrown away. In Louisiana all the higher grades are sold for table use. All of this product can be used for making alcohol and stock food.

PINEAPPLE GROWING IN PORTO RICO.[1]

[Extracts.]

By H. C. HENRICKSEN and M. J. IORNS.

VI.

VARIETIES.

The demand for fruit causes plantings to be made at all seasons with plants of all grades, and as a result fruit is maturing in all months. It is even yet a question whether definite seasons will not come again, but it is probable that a planter by varying the controllable factors can mature most of his fruit at any desired time of the year. From the marketing standpoint this is very important, for he can thus mature his fruit at the season when the prices are best. This will necessitate each planter's keeping careful and complete records of his work and local conditions.

MATURITY OF FRUIT.

The proper degree of ripeness for gathering is very difficult to describe, especially as the fruit begins to mature at base and at core first, so that one portion of the fruit is riper than another. Much depends also upon the length of time necessary to put the fruit into the consumer's hands.

There are several ways of judging the degree of ripeness. These are the development of the crown slips, the eyes, and the general color. As the pine ripens, the crown opens out, the eyes flatten, and the margins round up; the spaces between the eyes open and grow lighter in color; and the little leaflets wilt, then shrivel. As most fruit is picked quite green, only much experience and testing will give one any degree of skill in determining just the condition best for picking. As a rule the more nearly ripe the pine can be allowed to become before gathering, the better the quality; but usually the pine will ripen and color fairly well after being gathered if the eye margins

[1] From The Porto Rico Horticultural News, November, 1909.

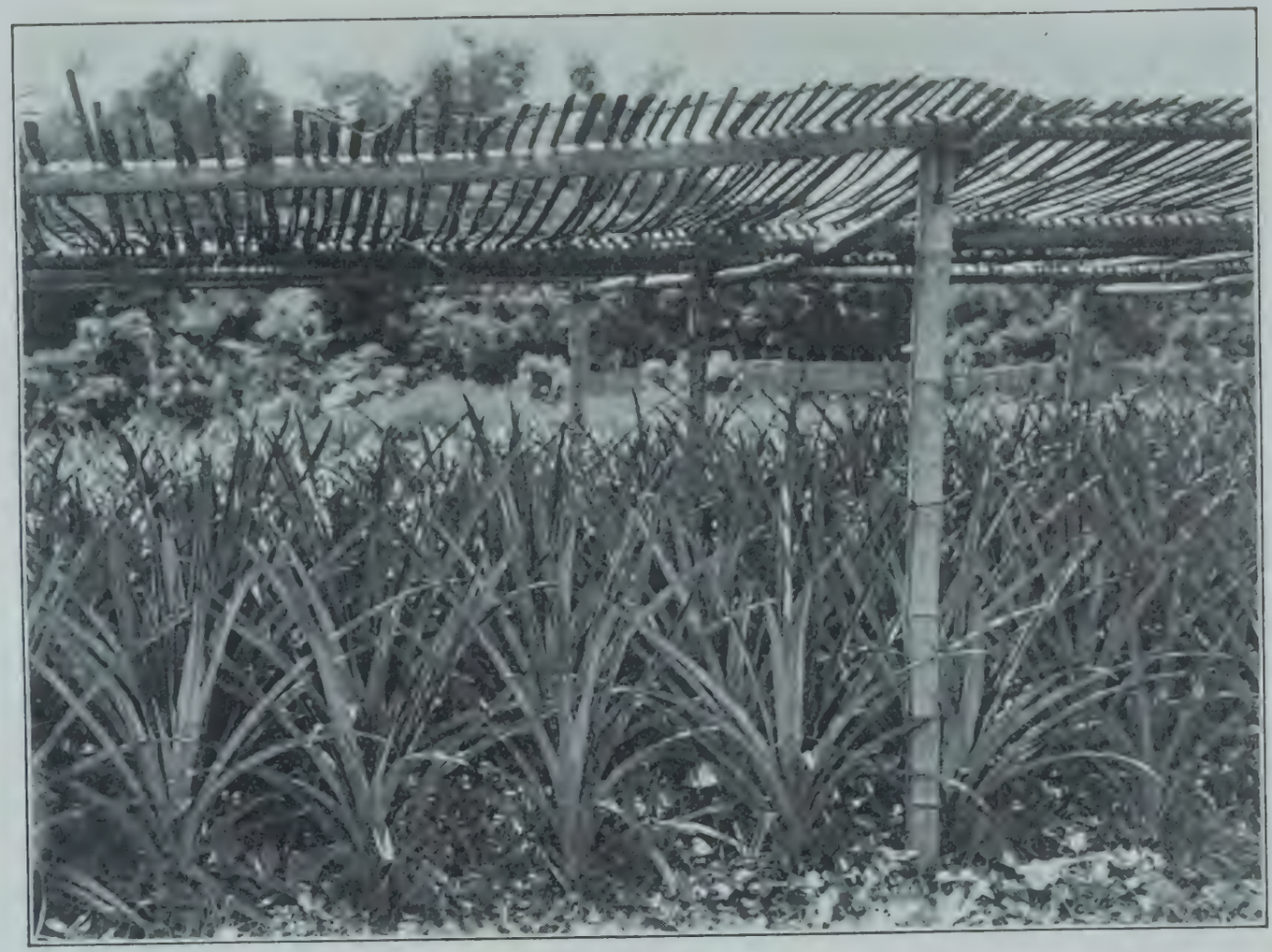

PLATE II.—PINEAPPLES GROWING AT LAMAO (UNDER HALF SHADE).

are well rounded, the spaces between show a light greenish yellow, and the leaflets are wilted or withered. If gathered earlier, the fruit may be apparently ripe, but the quality will be poor and usually the color as well. A soft fruit indicates improper soil or fertilizer conditions.

YIELD.

The yield of pineapples is such a varying quantity and dependent upon so many factors that it is almost impossible to make any definite statements. It is the yield in its broad sense of both quality and quantity that determines the grower's success.

FIELD AFTER FRUITING.

How to treat a field after the crop is gathered becomes a complex question where the fruit is ripening over such a long period. As shown under the discussion of fertilizers, as soon as the fruit is gathered the plant should be fertilized. Where fruit matures very irregularly this can be done by having a man go over the field after every heavy picking and fertilize the plants from which the fruit was just gathered. The small expense will be more than gained in growth of slips and suckers.

A second need after fruiting is a thorough cleaning and cultivation. This is difficult to accomplish, as it is not wise, if it can be avoided, to cultivate strongly those plants having fruit nearly mature. Such cultivation may result in renewed growth and yield soft fruit. On the whole, it is best to wait until most if not all the fruit has matured for the thorough cleaning of the field. At the time of cleaning, all diseased and poor plants should be removed and their places, as well as all vacancies, filled with strong, vigorous ones.

At this time some advise cutting off the leaves of the old plants. While it is a good plan to clean the plant from dead or badly injured leaves, it is not advisable to cut others except in special cases. If the field is in such a condition that good work in cleaning can not be done without it, then it may be best to cut off the old leaves. It must be remembered, though, that the leaves are the part that change the elements of the soil and air into food for the plant and any injury to them decreases the amount of food that can be formed in a given time.

As the root system is very shallow, if there has been much washing or working away of the soil, the earth should be thrown into the bed around the plant to the depth of 7 to 10 centimeters. This not only covers the roots, but also helps support the old plant. Care should be used to see that the middle of the bed is kept higher than the sides to assist drainage.

As fast as they mature the slips and suckers should be removed. If all are not desired for planting, then it is well to remove the smaller, weaker ones as soon as possible, thus throwing all the strength of the plants into the ones needed. The number of rattoons and suckers left to bear the next crop depends on the bedding and richness of the soil. Usually two are left to each plant. If the ground is very rich and one expects to fertilize well, three and even in extreme cases four of the best rattoons and suckers may be left. In the single-row system only the rattoons or possibly the very lowest suckers can be left, as any others would probably fall over and either break off or allow the fruit to be sun scalded. In a several-row system the retention of only the lower suckers and rattoons is not so necessary, and the closer the plants the more this is true, but in all cases suckers from near the top should be avoided if possible. Usually, if the upper suckers are pulled off, others will be formed lower on the plant, and even the development of rattoons can often be caused by removing the suckers first formed.

The length of time a field may be kept continuously in pineapples depends most upon its fertility, but the nature of the soil, the weeds and grass, the system of bedding, and the tendency of the mother plants to propagate by rattoons or low suckers also are governing factors. Where the ground is strong, heavy, and weedy, it is probable that three to four years is as long as the field can be economically continued. In such cases a rotation of three crops of fruit, then a deep plowing and two or three cultivations, then about two good crops of cowpeas, at least one of which is turned under, then another deep plowing and thorough cultivation, followed by replanting with pines will prove very satisfactory. The cultivation and two crops of cowpeas should not take more than eight or nine months and would more than pay for the loss of time. When the other factors can be controlled, a field may be continued from eight to fifteen years, or as long as the fertility is such as to keep them up to profitable size. In Florida this is from five to ten years; in Cuba, five to eight years; and in the Bahamas, in exceptional cases, as much as fifteen years.

MARKETING OF PINES.

To grow a first-class pineapple requires more skill and intelligence than is usually considered necessary, but to market it well requires even more. "Marketing" embraces two quite distinct operations: First, the preparation for the market; and, second, the actual finding of the market, the transportation

thereto, and the selling of the fruit. The preparation of the fruit for the market involves two series of operations—those of the field and those of the packing house.

GATHERING.

In the picking of the fruit, the method of bedding, the variety, and the size of the plants influence the method used. Pineapples, probably because of their appearance, are commonly considered able to stand rough handling. On the contrary, they are very susceptible to injuries, especially in the field before curing, and should be handled almost as carefully as are strawberries or ripe avocados.

Because of the spines, the pickers should wear long-sleeved, heavy canvas gloves, and where they must walk through the pines it is also well to have protection for their bodies.

Stiff bushel baskets are best for collecting the fruit. In the one to five row systems of bedding each picker carries his own basket. In larger beds it is more economical to have extra men to collect fruit from the pickers, regulating the number of baskets, not quantity of pines. Each fruit should be placed in the basket, not thrown or dropped. The Red Spanish can be broken off its stem by a quick sidewise and downward jerk or by placing the knee against the fruit stalk and giving the fruit a quick jerk across the knee. The Cabezonas must be cut off, since, if broken like the Red Spanish, the stem will break deep into the fruit and decay will soon follow. A good way is to cut a long stem with a machete, and then in the packing shed arrange a cutting knife like that used in stores for cutting tobacco, dried beef, etc. Keep the knife sharp so it will make a clean, smooth cut flush with the base of the pine, being careful not to bruise the fruit. All other varieties are treated like the Red Spanish or the Cabezona, depending upon how they break from the stem.

COLLECTING CRATES.

From the picker's basket the fruit is transferred to the crates for transportation to the packing shed. It is here that much fruit is injured by roughness and carelessness. The fruit should be transferred by hand and not dumped or thrown out. Care should be taken also to see that the fruit of one is not crowded against the crown of another, as the punctures caused by the spines afford ingress to spores of decay. The collecting crate should be deep enough to hold not more than two layers and allow another crate to be placed upon it without touching the fruit. The crates should also "nest" into one another so they

will hold firm upon the wagon. This nesting can be easily made by nailing strips around the outside of each crate, allowing the strips to project from one-half to 1 inch above the ends and sides. Care should be taken to see that there are no nail points, slivers, or projections of any kind that can injure the fruit. It is natural, when transportation facilities are not first class, to lay the poor carrying of fruit upon the transportation company. Even if the transportation facilities are poor, it is safe to say that a considerable proportion of the rotting of the fruit is due to injuries received by carelessness in gathering and preparation for shipment.

VII.[1]

CURING.

The time necessary for curing depends upon the conditions just before and during picking. If the fruit is picked in dry weather, cooling is the essential factor. The fruit should be put in an open, dry shady place one night, or at the most two. If gathered when moist or during wet weather, as is sometimes unavoidable, then the fruit must be dried as well as cooled, and this will sometimes require three or four days. For this curing set the pines or their crowns base up. This necessitates the curing shed being as cool, dry, and airy as location and construction can make it. Damp and uncured fruit is often shipped, and may carry through in good condition, but it is not safe to take the risk.

GRADING.

It is questionable if it is advisable to make more than one grade for shipping. If a local cannery is available, the culls could be worked up there, as the margin of profit on shipped fruit generally hardly justifies shipping second grade fruit except at times of especially high prices. First-grade fruit should be free from sun scald or other injury, of good form for the type, of proper degree of maturity, and of good quality. Some of these are difficult to determine, but one handling much fruit can, by close observation, grade very accurately. In a strictly first-grade pack the crown should also receive consideration, all the pines being as uniform as possible.

[1] Porto Rico Horticultural News, February, 1910.

AGRICULTURAL CONDITIONS IN MASBATE.

By JAMES C. SCOTT,

Head teacher for the subprovince of Masbate.

Masbate, until November 23, 1905, a province, is now a subprovince of Sorsogon. This subprovince has an area one-half as great as that of Porto Rico, while the Island of Masbate alone equals in size the state of Rhode Island. The change became necessary for economy in administration, and is directly due to the loss by disease of the great number of cattle which only a few years ago grazed on the grass-covered hills and plains and supplied the markets of Manila and adjoining provinces.

In no other part of the Philippines, in regard to economic conditions, may the present be so unfavorably compared with the past; but once free from surra and rinderpest, and with development of the rich mineral and agricultural lands, Masbate will again, in time, take a place among the most prosperous of provinces. Already the number of cattle and other live stock is increasing rapidly. However, epizoötia is still prevalent, and not only causes loss to those who are trying to increase their herds, but discourages others who are considering investment in this enterprise.

Primarily, Masbate is adapted to stock raising. With a nutritive grass covering fully one-half of the entire area and affording rich pasture every month in the year, with springs and rivulets in abundance everywhere, a rancher should find a paradise here. But the complete loss a few years ago of hundreds of herds of cattle, carabaos, and horses, caused the people to look for other means of obtaining a livelihood and it was not till then that the great agricultural possibilities were discovered. But the people had much to learn and the change from the saddle to the plow was not welcomed. Too often the former independent owner of large herds of cattle is now seen living in penury, barely obtaining a living from a hectare or two of corn, tobacco, and coconuts, a tiller of the soil by necessity and not by choice. But others are awake to the change and its possibilities and are planting on a large scale. Newly made "kaingins" are features in

every locality, the acreage of coconuts is rapidly increasing, corn and rice are grown in larger quantities and tobacco production is becoming important.

All of the thirteen towns of Masbate are located on the coast. Days of travel in the interior of Masbate Island will not reveal a single dwelling. Bancas and sailboats furnish transportation between the towns. The port of Masbate, or Palanog, has one of the finest harbors in the Philippines, and all the other towns may be reached by steamer. Land travel is by means of trails which change with the wet or the dry season or, if along the coast, with the high or the low tides. Traveling by land is difficult, owing to the extensive low coasts covered with manglay and frequently cut by impassable rivers infested with crocodiles. The only good road at present in the subprovince is $3\frac{1}{2}$ miles in length and connects the Aroroy mines with the town on the coast. Surveys have been made for a road across the island from Milagros to Lumbang and one from Masbate to Mobo.

The extent of damage caused by the destructive typhoons of 1908 and the suffering resulting therefrom is not realized by one who has not traveled recently in the subprovince. In the September typhoon trees were completely stripped of leaves and fruit. Coconuts (the principal crop), bananas, and cacao were a total loss for one full year, while all other crops were badly injured, not to mention destruction to other property. This destroyed the food supply. Barrios are found deserted, the inhabitants living in the woods searching for roots and wild fruits to prevent starvation. Those living in the coconut districts suffered most severely. Swarms of locusts appeared in July and August and greatly injured the corn crop, in many cases causing complete loss. At present writing, a year later, scarcely a coconut or banana has been harvested, but the trees are loaded with an exceptionally heavy crop and harvesting will soon begin. The area of cultivated land has been largely increased and the coming year should be a prosperous one.

Reports from all towns indicate loss of fully one-fourth of last year's corn crop from locusts, with much damage done to other crops. The swarms of locusts come to Masbate largely from Capiz and Cebu. A large number are hatched in the extensive unpopulated cogon fields of the Placer and Pulanduta Peninsulas on Masbate Island. The pest will never be exterminated by local authorities without Insular or provincial acid, and interprovincial coöperation and organization on a much larger scale than has so far been attempted. The rewards

offered this year, so much per sack or cavan of locusts captured, served no purpose, except to provide employment for those whose crops were entirely destroyed.

Several methods are used in Masbate in capturing locusts. Nets are used successfully, and pits filled with water with a V-shaped fence or netting opening in the direction in which the young locusts travel, are even more successful.

Coconuts.—Coconuts are grown in nearly all of the towns of the subprovince. One of the best coconut districts of the Islands lies along the coast extending through the municipalities of Uson and Dimas-Alang. The groves are in fair condition, the undergrowth being cut, but not cultivated. In other towns the groves are in a half-wild state. The mistake is made generally of too close planting.

The rhinoceros beetle (uang) causes considerable loss at present by boring into and destroying the bud. Crows, which seem to increase year by year, are the cause of more complaint than any other enemy.

Tuba from the groves at Palanas, Island of Masbate, is claimed to be the best in the Islands. Ticao Island promises to become one of the leading coconut areas, and planting continues in all parts.

Rice.—The consumption of rice in the subprovince is comparatively small, and 25 per cent of what is consumed is imported. This is due to the light rainfall and poor irrigation facilities. Much of the land which could be used for rice is left unused on account of the uncertainty of the crop. With the development of irrigation facilities, afforded by the numerous large rivers, and proper cultivation enormous crops of rice could be produced. The Uson and Milagros districts are awaiting irrigation projects to become of great agricultural importance.

The present condition of rice is very good. In several towns harvesting has just been completed with fair crops. Upland rice is raised to some extent.

Sugar cane.—This product grows in a few localities, but rainfall is not sufficient for a heavy growth. Very few mills are in operation.

Tobacco.—Tobacco is raised in sufficient quantities to supply 95 per cent of home consumption and exportation of 15 per cent of the total crop. The farmers understand little of cultivation and curing of this crop. Experiments show that a high-grade leaf may be raised here.

Abacá.—Abacá competes with copra as the most important export, and the Island of Ticao leads other localities in this product.

Corn.—Two crops of corn are raised yearly. It is only in recent years that this crop has become of importance. Methods of cultivation are still primitive. The ground is cleared but seldom plowed, and in planting, a hole is made in the ground with a stick during the rainy season and a grain dropped into the hole. A pressure with the foot does the rest. Pulling weeds is the extent of cultivation. Even under these conditions a fair crop is raised. With proper methods two or three heavy crops could be raised yearly.

Other crops.—Camotes and the "camoting cahoy" do well in the subprovince. They are an important item of food during the seasons when other food products are destroyed. Cacao grows well on the hillsides and is quite extensively planted. The kapok tree grows exceptionally well, but little kapok is exported. Maguey has been experimented with thoroughly in all towns, but does not grow well in Masbate, and is now regarded with disfavor by the people generally. Guayabas grow on every uncultivated hillside.

ABACÁ FIBER.

By M. M. Saleeby, *Fiber Expert.*

STALK FORMATION.

The abacá stalk consists of a fleshy central core and a number of overlapping sheaths. This core is a continuation of the fleshy part of the rootstock, and, as it grows, sheaths are formed on its sides at irregular intervals. When the stalk reaches maturity sheath formation stops; but the core keeps growing and forms what is known as the "flower spike." The central core, therefore, is really the flower stalk, and its sheaths are the petioles of the leaves. This core diminishes in diameter as it rises in the middle of the stalk. Its diameter at the base of the stalk varies from 15 to 35 centimeters, and at the top it rarely exceeds 4 centimeters.

The sheaths are of a crescent shape and are so tightly laid one upon the other as to form one solid mass. They overlap in such a way as to have one of their lateral sides under the preceding sheath and the other above the succeeding one. These sheaths are thickest at the middle and at the base, and diminish gradually toward the lateral edges and toward the top. The width of these sheaths also varies, the fourth, fifth, sixth, and the seventh are usually the widest and thickest. Both the thickness and width depend on the position of the sheath, and range from $1\frac{3}{4}$ to $2\frac{1}{4}$ centimeters and 15 to 25 centimeters in the exterior sheaths to 7 millimeters and 8 to 10 centimeters in the interior sheaths, respectively.

The stalk consists of 16 to 25 sheaths, depending on the variety and extent of growth. None of the sheaths are exactly the same length as the stalk. The exterior sheaths rise from the base of the core but do not extend to the top of the stalk, and the interior ones, which extend to the top, do not rise from the base but at variable intervals above it. The sixth, seventh, and eighth sheaths are usually the longest, varying from $2\frac{1}{2}$ to $5\frac{1}{2}$ meters.

A look at a cross section of the sheath shows that it consists of three distinct, though not well-defined, layers. The outside layer is a fibrous ribbon that contains most and the strongest of the fiber, and is about 4 to 5 millimeters thick. The middle layer consists, for the most part, of a row of cavities separated by longitudinal and transverse partitions or walls. The longitudinal walls contain few fine and white fibers that are weak, but the transverse walls are thin, fiberless, transparent membranes. The third layer is a mass of useless, fiberless tissue, its width rarely exceeding 2 or 3 millimeters.

The outside layer is the one that the strippers separate in three or four strips in the first process of fiber extraction. During the process of separating these strips a part of the fiber in them remains attached to the lower layer; and also when these are pulled under the knife, some more fiber is wasted, of which large quantities can be seen piled in heaps in front of every stripping shed. It is estimated that 30 per cent or more of the fiber of this layer is wasted during the two processes of extracting the fiber.

The fibers found in the longitudinal walls of the cavities of the middle layer as well as the fiber found immediately above is, as mentioned above, both rare and weak. Rope manufacturers object to its presence in the fiber obtained from the upper layer, because during the operation of stretching and twisting, this fiber breaks and collects in a sort of a knob known as "tow spot." It is on account of this fact also that the manufacturers refuse to buy the fiber extracted by machines that save this weak fiber.

DESCRIPTION OF THE FIBER.

Abacá fiber is very light, strong, and of good tenacity. When properly extracted and dried, it is also of a white, shining color. It divides easily into smaller fibers of a regular diameter. Running through its length is a central cavity which is both large and apparent. The walls of this cavity are of uniform thickness, and its form resembles the form of the whole fiber, which is in most cases oval. The end of the fiber tapers gradually and the point is acicular or slightly rounded.

CLASSIFICATION OF THE FIBER.

Softness, color, and strength are the qualities usually considered in grading the fiber. The degree of softness, color, and strength is affected by soil and climatic conditions, by the variety

cultivated, by the position of the sheath in the stalk, and by the manner of extracting, drying, and handling the fiber. In the same soil and climate, and in the same variety, the extent of growth affects the quality of the fiber. The larger stalks contain a coarser, darker, and stronger fiber than that found in the smaller ones.

The fiber increases in softness and whiteness, but decreases in strength, from the outside sheaths toward the inner ones, those around the core being the softest, whitest, and weakest. After every four or five sheaths we invariably find a noticeable change in the quality of the fiber. Given from 16 to 25 sheaths to the stalk, the position of the sheaths will, in itself, be responsible for only four or five grades. But, owing to the imperfect method of extracting the fiber and the lack of care in drying and handling it, we find as many as 17 grades, the lowest five or six of which have no reason to exist.

The following are the standard grades of abacá fiber as known in the American and European markets:

BEST MARKS OR F. E. A. QUALITY.

(1) 300 per cent over good current.
(2) 250 per cent over good current.
(3) 200 per cent over good current.

GOOD MARKS OR F. E. B. QUALITY.

(4) 150 per cent over good current.
(5) 100 per cent over good current.
(6) 50 per cent over good current.

MIDDLE MARKS OR GRADES.

(7) Good current.
(8) 75 per cent over fair current.
(9) Midway.
(10) 25 per cent over fair current.
(11) Fair current.

LOW MARKS OR GRADES.

(12) Superior seconds.
(13) Good seconds.
(14) Fair seconds.
(15) Good red (brown).
(16) Fair red (brown).
(17) Daet current.
(18) Strings.

CONCLUSION.

The principal differences existing among the different varieties of abacá, such as the size of the stalks, the percentage of fiber, and the percentage of each grade in each variety, is clearly shown in the following table. The data contained in these tables were collected from a series of experiments made in different localities in the Davao district. The number of stalks used is three of each variety, and the grading was made by the expert of Messrs. Smith, Bell & Co.

All operations were made by the ordinary native method, and under ordinary conditions. The size of the stalks is above the medium in the majority of the varieties, but other than that, there is no reason whatever why every planter should not obtain the same results, especially in the quality of the fiber produced.

Table No. 1.

Names of varieties.	Total weight of stalks.	Average weight of one stalk.	Average length of stalk.	Average circumference at base.	Average circumference at top.	Weight of dry fiber.	Percentage of fiber.
	Kilos.	*Kilos.*	*Meters.*	*cm.*	*cm.*	*Kilos.*	
Tangongon	266	88.67	5	84	40	6.89	2.6
Bangulanon	100.5	33.50	3.8	59	33	2.34	2.3
Maguindanao	259.5	86.50	4.6	84	36	4.40	1.7
Libuton	218.1	72.70	4.3	84	41	3.73	1.7
Arupan	209	69.70	3.9	79	46	3.78	1.8
Puteean	190	63.30	4.1	71	36	3.42	1.8
Sinaba	186	62	4.2	72	43	2.52	1.3
Baguisanon Lawan	318	106	5.4	87	41	4.53	1.4
Agutay	119.5	39.80	3.8	65	35	1.80	1.5

Table No. 2.

Names of varieties.	Best marks or F. E. A. quality.		Good marks or F. E. B. quality.		Middle marks.		Low marks.	
	Kilos.	*Per cent.*	*Kilos.*	*Per cent.*	*Kilos.*	*Per cent.*	*Kilos.*	*Per cent.*
Tangongon	1.700	24.75	3.525	50.50	1.660	24.25		
Bangulanon	1.200	50.75	.960	41.25	.180	8.00		
Maguindanao	2.325	52.50	1.800	41.00	.275	6.25		
Libuton	1.065	29.00	1.700	45.75	.715	18.50	0.250	6.7
Arupan	1.515	39.50	1.675	44.50	.590	16.00		
Puteean	2.520	72.50	.540	16.75	.360	10.75		
Sinaba[a]	1.200	47.00	1.200	48	.125	5.00		
Baguisanon Lawaan	2.290	50.00	1.790	39.50	.450	10.50		
Agutay	.775	43.00	.700	39.50	.325	17.50		

[a] The percentage of the highest grade of fiber in this variety should be much higher than it is. The sample accidentally got wet prior to grading.

Approximate weight and strength of Manila rope.[1]

Diameter, in inches.	Circumference, in inches.	No. of feet in 1 pound.	Length of coil, in fathoms.	Weight of coil, in pounds.	Working strength estimated in pounds Not guaranteed.
----------	(a)	160	1,800	70	250
----------	(b)	90	1,000	70	375
----------	(c)	66	720	70	430
3/16	(d)	92	400	25	425
1/4	(e)	51	400	50	500
5/16	(f)	35	300	50	800
3/8	(g)	24	200	50	1,000
7/16	1 1/4	18	200	65	1,200
1/2	1 1/2	11.6	135	70	1,680
9/16	1 3/4	10	135	80	1,920
5/8	2	8.1	135	100	2,400
3/4	2 1/4	6.8	135	120	2,880
13/16	2 1/2	5.5	135	150	3,600
7/8	2 3/4	4.9	135	190	4,560
1	3	3.6	125	205	5,100
1 1/16	3 1/4	3.1	125	240	6,000
1 1/8	3 1/2	2.7	125	276	6,900
1 1/4	3 3/4	2.3	125	324	8,100
1 3/8	4	2	125	372	9,300
1 7/16	4 1/4	1.8	125	408	10,200
1 1/2	4 1/2	1.6	125	456	11,400
1 9/16	4 3/4	1.4	125	516	12,900
1 5/8	5	1.3	125	576	14,400
1 3/4	5 1/4	1.2	125	636	15,900
1 7/8	5 1/2	1.1	125	696	17,400
1 15/16	5 3/4	1	125	756	18,900
2	6	.9	125	830	20,700
2 1/8	6 1/2	.71	125	972	23,700
2 1/4	7	.68	125	1,140	27,900
2 3/8	7 1/2	.60	125	1,275	32,100
2 1/2	8	.51	125	1,500	36,900
2 5/8	8 1/2	.45	125	1,700	41,700
3	9	.40	125	1,900	47,100
3 1/8	9 1/2	.36	125	2,150	52,500
3 1/4	10	.32	125	2,400	58,500
3 3/8	10 1/2	.30	125	2,600	64,500
3 1/2	11	.27	125	2,900	70,800
3 5/8	11 1/2	.24	125	3,150	77,400
4	12	.22	125	3,400	84,600
4 3/16	12 1/2	.20	125	3,700	91,800
4 1/4	13	.19	125	4,000	99,000
4 3/8	13 1/2	.18	125	4,400	107,400
4 7/8	14	.16	125	4,700	115,800
4 15/16	14 1/2	.14	125	5,000	124,200
5	15	.13	125	5,400	132,600

[a] 2-thread bale. [c] 4-thread bale. [e] 6-thread. [g] 12-thread.
[b] 3-thread bale. [d] 6-thread fine. [f] 9-thread.

The working strength is estimated at 100 pounds to the thread, in a new rope. Breaking strain 50 per cent more.

[1] This table was taken from the Portland Cordage Company's catalogue No. 5, page 9.

PRUNING.[1]

Physiology of pruning.—To be an intelligent pruner one must know something of plant physiology. He should know the effects produced by pruning at different seasons of the year, how to make a cut that will heal most readily, and the influence of pruning on the fruit-bearing habit of the tree. * * * It is generally conceded that pruning during the dormant season incites wood growth, while pruning during the growing season promotes fruitfulness. * * *

Although it is said that pruning during the summer season may encourage the formation of fruit buds on tardy-bearing varieties, it may have the opposite effect, unless done at the proper time, and may cause late growth and unfruitfulness. To give the desired results one must prune shortly before the season of growth ends; earlier pruning starts new growth, while late pruning gives no results. The benefit derived from summer pruning seems to depend upon the ability of the pruner to prune at a time to bring about early maturity. In an irrigated section, where soil conditions are easily controlled, the same end may, no doubt, be more easily attained by proper manipulation of the irrigation water.

Both the season at which the wound is made and the character of the cut have an influence upon the healing process. The pruner should remember that all food material capable of healing a wound is taking a downward course through the inner bark, and that to heal well a wound must be in a position to intercept the downward flow of sap from foliage higher up. When a limb is to be removed entirely, the cut should be at the union with and parallel to the surface from which the limb arises. Where limbs are to be headed back, they should be cut to a side limb and not to a bare stub. Wounds naturally heal best when made at a season of the year when growth is most active, but with the possible exception of wounds made in early winter

[1] Compiled from Bulletin No. 139 of the Colorado Experiment Station, and published in full in U. S. Department of Agriculture Farmers' Bulletin No. 388.

and subjected to a long season of drying, the season at which the wound is made has no important bearing upon the healing process. The grower who has a small orchard that will permit of such a practice should delay the pruning until as near the opening of the growing season as possible.

The influence of pruning upon the fruit-bearing habit of the tree has been briefly mentioned, but a fruit-bearing habit may, to a certain extent, dictate a course in pruning. The fruits with which this discussion has to deal have two general types of fruit bearing—from terminal fruit buds and from axillary fruit buds. The first type of fruit bud is well represented in the apple and pear, and the latter in the stone fruits. Varieties which develop axillary fruit buds and bear terminal fruit buds on young spurs all tend to overbear, and require severe pruning. So to a certain extent one can decide for himself how much to prune by observing how the tree bears its fruit.

Treatment of wounds.—The argument in favor of dressing wounds is that it prevents decay and checks evaporation, both of which might interfere with the healing process. Yet, the matter of dressing wounds is not so important but that work improperly done is worse than no treatment. A good lead paint is one of the most satisfactory dressings yet found. Rather a thick paint should be used, and careless daubing of the surrounding bark should be avoided. Grafting wax is a good dressing, but is rather expensive and difficult to apply. Other materials have been used, some successfully and some disastrously, and the grower is to be cautioned about experimenting; better stick to materials known to be safe and efficient. Growers often overdo the matter and waste time treating small wounds.

These suggestions apply to wounds made by the careless cultivator, as well as those made by the pruner. Unsightly wounds and permanent injury may often be avoided by proper treatment of trunk wounds. When the body of the tree is injured, the ragged edges of the bark should be pared off to sound tissue and the whole injury covered with paint or grafting wax. If promptly done, this prevents drying out of the tissues, and new bark will readily form, except on parts where the outer wood cells are actually destroyed, and in time this will grow over. Wrapping the injury with cloth, or if it is near the ground mounding earth up over it will often answer the same purpose.

Pruning tools.—Every pruner should be furnished with good tools; good tools encourage him to do good work. This does not necessarily mean that he must have every tool on the market.

Many of them are useless. It does mean, however, that the ax and a dull saw have no place in the catalogue of pruning tools. The pruner needs a good saw, a good pair of light shears, a pair of heavy shears, possibly a good heavy knife, and, of course, a good ladder. Two common types of saws are found on the market. The common saw with teeth on both edges is a good, cheap one and will answer the purpose in many cases. The various makes of the swivel saws are much handier, however. The blade is stretched between swivels and can be turned to any angle with reference to the frame. It is well adapted to close work in the crotches of the tree.

CURRENT NOTES.

CONDITIONS IN DAVAO.

The Mindanao Herald for April 23 publishes an interview with General Pershing, who had at that time just returned from a trip to Davao and the Cotabato Valley. General Pershing is quoted as follows:

Conditions in Davao have improved very materially since December. At that time there was scarcely a planter who did not complain of a lack of labor. The majority of them were clamoring for the importation of labor from the northern islands. A transport was under charter, engaged in gathering up Filipinos from wherever they could be obtained. The provincial government was paying the expenses of this steamer. With all the effort that was made to import Filipino labor, something like two hundred were brought to the Gulf of Davao. These have turned out to be worthless as laborers and a large number of them have become vagabonds.

Ever since my experience among the Moros ten years ago, I have felt that the solution to the labor problem in the Moro Province is to utilize the labor we find here. When I visited Davao in December, the planters were told that they must work out their own salvation so far as labor was concerned, and learn to handle the hill man. They have evidently gone at it with a determination to succeed, and the result has been admirable.

The Planter's Association has taken hold of the matter, and, with the assistance of the civil officials, it can be said that there are very few planters to-day that have not all the labor they can use. The danger now lies in the planter increasing his acreage too rapidly. The provincial government will continue its efforts to encourage the hill men to learn civilized ways and to establish small settlements in the vicinity of various plantations. Those men who have been successful from the start followed this plan, and others are now doing the same thing.

The new laborers that have come down from the hills during the last six months seem to be very contented, and those who did not bring their families at the start are making arrangements to do so. Each planter has undertaken to provide his laborers with houses and small tracts of land that may be cultivated, and the planters in general are taking a personal interest in the well-being of the hill man who comes to labor for them. To make only a small profit on goods, and to pay the laborers a fair wage in money, are two essentials to success in handling hill labor that the inexperienced planter is beginning to realize. I predict for the American colony in the Gulf of Davao continued progress and success.

I should like to have all investors in this province know that the government of the province stands ready to offer every assistance in obtaining labor for those who have so far been unable to obtain it, and that any new enterprise coming into this province will receive every encouragement.

RINDERPEST UNDER THE SPANISH RÉGIME.

The municipal president of Lucban, Tayabas, has sent to the Bureau of Agriculture a copy of a small bulletin issued in 1888 from the press of Tipo-Litografía de Chofré y Comp., Escolta, núm. 33, entitled "La Epizootia. Cartilla para precaver á la ganadería de algunas enfermedades comunes." This bulletin was published in parallel columns in Spanish and Tagalog, but there is no intimation as to who was the author. On the last cover page there appears:

NOTA.

Esta cartilla ha sido estractada de la Memoria, titulada: "Una epizootia en Filipinas," y se publica de orden de la Dirección general de Administración Civil.[1]

OTRA.

La tirada particular de aquella Memoria se vende al precio de dos pesetas ejemplar en la Agencia Editorial, Carriedo, N.º 2, Manila, y en la Librería de Ntra. Sra. del Carmen, Real de Manila N.º 12.[2]

The general trend of the text shows that it was intended as a means of educating the people as to the cause and nature of rinderpest and the means of placing it under control. There was but little known about rinderpest in those days and no serum was available as at the present time. About the only remedies prescribed were disinfectants for the premises and purgatives for the affected animals.

RUBBER IN BASILAN.

Mr. F. T. Winters, of Basilan, has a plantation on the Gubanag River, of which the soil is a very rich alluvial deposit. There are about 300 Ceara rubber trees growing on it which are now nearly 4 years old. They were planted directly from seed in July, 1906, at a distance of 15 feet (4.5 meters) apart, and have attained a height of from 15 to 30 feet (4.5 to 9 meters). The trees average 7 to 9 inches (17 to 22 centimeters) in diameter. None of them have yet been tapped.

Mr. Winters has obtained the best results by planting the seed directly in place. His experiments with cuttings, however, have proved fairly satisfactory. About 60 per cent took root and are still doing well. He recommends that care be taken not to damage the cuttings in any way, and after planting they should be

[1] This pamphlet has been extracted from the report entitled "Rinderpest in the Philippines," and is published by the office of the General Director of Civil Administration.

[2] This report is sold at 40 centavos per copy at the Agencia Editorial, No. 2, Carriedo, Manila, and at the bookstore of Ntra. Sra. del Carmen, No. 12, Real, Manila.

kept moist and sheltered. Mr. Winters states that his observation and personal experience lead him to believe that Ceara rubber should be planted at least 50 feet above sea level and in well-drained land. He gives the following reasons for this: (1) In low lands the trees branch too near the ground, and (2) as the roots of Ceara trees reach to a great depth there is danger from too much moisture, which results in dry rot of the roots, and causes the trees to break off close to the ground.

With older trees he found it necessary to trim off a number of branches each year, as the trees have proved very hardy, needing little care, withstanding drought very well, and growing rapidly.

The Moro inhabitants of Basilan are displaying much interest in the cultivation of rubber and are given every encouragement by the government officials.

Mr. C. F. Miller, also of Basilan, states that the Para, Ceara, and Castilloa rubber trees planted by him on that island have all made a very remarkable growth, and promise excellent returns in the future. On this plantation Ceara trees of 4 years 7 months are from 10 to 14 inches (25 to 35 centimeters) in diameter, and Para trees of 3 years 6 months are from 2 to 4 inches (5 to 10 centimeters) in diameter 3 feet from the ground. The Castilloa trees are only 8 months old but are growing very well.

SCHOOL GARDENS IN UNION PROVINCE.

The question of whether the school garden is worthy all the prominence it has been receiving recently, and the extent to which it can be made useful to the Filipino people as a whole, has been the source of much difference of opinion. Mr. North A. Foreman, a teacher in the schools of Union Province, stated, in an address before the agricultural conferences at the last Carnival, that in that province gardening is a part of the work of every primary school. Four thousand children do actual and successful work in these gardens every year. The parents of these children are as a rule of a class that can not be reached by means of bulletins and the other conventional methods of improving farming conditions, and the schools are their only point of contact with outside influences of this sort. The gardens are in reality small farms laid out in smaller fields, each child being given the entire care of his own plot, which he prepares and cultivates and from which he receives the products raised. The planting of home gardens is also encouraged, and hundreds are planted each year. The Filipino teachers are admirably fitted to carry on work of this sort successfully, for they have been trained to understand American ways, and at the

same time they have grown up in the community and are thoroughly in touch with the people and their necessities.

Mr. Foreman believes that by encouraging the children to farm intelligently in ever so small a way, using in their work the tools that their parents have and obtaining better results, the class of products raised and farming methods generally will be greatly improved throughout the country.

PHILIPPINE WOODS IN THE UNITED STATES.

A news note furnished by the Bureau of Forestry informs us that the hardwoods from the Philippine Islands are exciting so much interest in the United States that the chief of the United States Forest Service Office in San Francisco has requested the Philippine Bureau of Forestry to send him a collection of wood samples to be kept on file in his office for the interest of California wood users and to assist in the identification of woods imported from Manila. It is stated that many of the woods found in the Philippine forests can not be excelled for beauty, strength, and other desirable characteristics, and meet with so ready a market in both America and Europe that the amount exported is dependent merely upon the capacity of Philippine sawmills.

The collection selected by Major Ahern contains not only the high-grade first-group timbers such as tindalo, narra, camagon and molave, whose exceptional beauty and durability have become well-known in all the lumber markets of the world, but also the softer woods which, contrary to popular ideas, are produced in the Islands in great bulk. Among these are tanguile and red and white lauan. These latter, especially tanguile and red lauan, while neither so hard nor durable as most of the woods of the first or second groups, have a beautiful color and grain, and are exported to the States as substitutes for mahogony. But not only are they adapted for cabinet making and interior finishing, but their cheapness and comparative ease of exploitation permit them to compete with Oregon pine and other structural timbers of the United States and Europe.

PROSPECT FOR CATTLE RAISING IN MINDANAO.

General Pershing, on his recent trip through Davao and the Cotabato Valley, is reported by the Mindanao Herald (April 23 and 30) as being most enthusiastic over the prospects for raising cattle in the region about Sarangani Bay. He stated that the country around this bay is especially adapted to grazing, and he believes that the pasture lands there are sufficient to supply

cattle for the whole Archipelago. He considers it a splendid opening for some one who understands handling cattle. "The country," he said, "abounds in clear, cool streams, without the usual accompaniments of swamps and marshes. In fact the country around Sarangani Bay reminds one very much of a stretch of country in northern Montana. It is ideal for stock." The land in question extends from the bay inland a distance of about 50 miles toward Lake Buluan. The relative location of the hills and mountains is such that precipitation takes place in the higher altitudes, and the rainfall of the lower land is less than in any other part of the Philippines. Many streams flow through this section, however, yielding a bounteous supply of water. The grass which grows here is much like the grama grass of New Mexico and Arizona. While Governor Pershing was at Glan, a small port near the entrance to Sarangani Bay, he saw a herd of about 100 cattle feeding on the grass, which were sleek and fat. Rinderpest is said never to have appeared in this part of Mindanao, so with proper precautions there should be no trouble from this source.

Governor Pershing suggested that in raising cattle native cows might be purchased at the beginning at a much lower price than imported cows, and they would probably be better adapted to the climate. The Bengali breed have been crossed successfully with Philippine cattle, producing a strain that will weigh 10 per cent more than the native animal. Bulls of this breed could be imported from India at about ₱200 per head. The resulting half-breed heifers of this cross should then be bred to Hereford or Shorthorn bulls.

NOTES FROM OTHER FIELDS.

JAPANESE PEANUT INDUSTRY.

Vice-Consul-General E. G. Babbit, of Yokohama, furnishes some interesting data regarding the peanut industry in Japan, which were published in the Monthly Consular and Trade Reports for March, 1910. He states that in 1908, 6,218,771 pounds [1] were exported, with a value of $221,570,[1] as against an exportation of 10,185,181 pounds in 1907, with a value of $352,673. He says:

The latest Government statistics covering the peanut industry—cultivation and production—of Japan are for the year 1907, when 14,825 acres [1] were under cultivation, which yielded 1,302,957 bushels [1] of nuts, of which 1,009,725 bushels were produced in the Yokohama consular district. According to the official returns for the three years preceding 1907, the decrease in production per acre has been very large, as will be seen from the following statement:

Year.	Acres.	Bushels.	Value.
1904	13,579	6,619,360	$3,955,730
1905	13,362	2,999,190	1,792,321
1906	21,858	1,855,545	1,108,874
1907	14,825	1,302,957	

Planting begins in April and May, and the dry sandy soil which is found poor for other crops is suitable for the cultivation of peanuts. The nuts used for planting are soaked in water for several days and planted in furrows 2 to 4 feet [1] apart, according to whether the variety is of the dwarf and upright or the creeping and spreading kind. Two or three nuts are planted in each hole, with fertilizer, and germinate in about ten days. The cultivation is not difficult, but water and fertilizer are necessary if the weather is not propitious, and the soil must be soft and loose, and kept free from grass.

The leaves turn, in November, to a yellowish white, and the plants are then pulled or dug and hung over the branches of trees or on trellises to dry; this usually continues during a week, when the pods are separated from the leaves and stems and cleaned with water, after which they are again dried by spreading upon mats in the sun.

Practically no machinery is used in the planting, cultivation, cleaning, or packing of peanuts in Japan. The only machine discovered in this

[1] 1 pound=0.45 kilogram; $1 U. S. currency=₱2; 1 acre=0.4 hectare; 1 foot=0.3 meter; 1 bushel=35 liters.

vicinity was a primitive winnow, the ordinary method of separating the chaff from the pods being that of fanning, requiring the labor of two persons, where a simple machine operated by one person would do the work much more quickly and better.

The nuts are packed, usually in straw bags, which have already done similar service for rice, usually containing 133 pounds, but peanuts for export are generally packed in gunny sacks of 100 pounds. The peanuts, as shipped from the districts where grown, are not baked, and it is only by the retailers, confectioners, or consumers that this is done. The baking is done by a very simple machine, usually charcoal-heated, the nuts being kept in motion by rollers turned by hand.

The crop is usually classified into best, medium, and ordinary, and the first two grades are promptly bought up by the earlier buyers. The lower grades are sold or retained for the purpose of manufacture into oil and oil cake. Occasionally, when the pods are discolored but the nuts are otherwise good, they are shelled and sold as shelled nuts in the local markets, where they are largely used in the confectionery trade.

There is a considerable peanut-oil industry in Chiba-Ken, the only prefecture from which statistics are available, but as this is one of the principal districts where peanuts are cultivated the figures can be taken as representative of the whole trade. The output of this district in 1907 was 32,021 gallons[1] of oil, valued at $15,221, and 767,241 pounds of oil cake, valued at $9,599, as compared with 42,885 gallons of oil, valued at $21,622, and 771,467 pounds of oil cake, valued at $11,878, in 1906.

This is conducted largely as "home industry," there being not more than five factories engaged therein as a "principal business," and of these only one is at present engaged in peanut-oil manufacturing. This factory is located in Chiba-Ken and uses a 16-horsepower engine.

The following statement shows the cost of manufacturing: Peanuts required for pressing out 48 gallons of oil, $35.36; wages, receptacles to hold the oil, and freight to Tokyo, $1.55; total, $37.41. Price of 48 gallons of oil, $27.39; by-products, $11.20; total, $38.59. Net profit, $1.18.

The market price in December, 1909, of oil and oil cake was as follows: Oil, superior, 48 gallons, $32.37; common oil, $27.39; oil cake, per 8.27 pounds, 11.2 cents. The oil is packed, as is the petroleum sold throughout Japan, two cans to the box, this packing costing about 18 cents.

FERMENTATION OF CACAO.

Regarding the fermentation of cacao, the Tropical Agriculturist for February, 1910, publishes the following information (translated from the German of Fickendy):

In the preparation of cacao the author distinguishes between two distinct processes, on the one hand the fermentation of the pulp—the sweet slimy substance in which the beans lie embedded in the fruit—and on the other the changes which go on in the bean itself, and really have nothing to do with fermentation or are only indirectly related to this process.

The purpose of fermentation is mainly to kill the beans without destroying the enzyme. The proof of this is that the most important changes which appear after fermentation, in the form of the brown coloration of the nibs and the reduction of the bitter taste, are also produced without fermentation

[1] 1 gallon = 3.78 liters.

if the beans are killed under conditions which do not destroy the action of the enzyme, e. g., by alcohol, by freezing or by grinding the beans to a pulp.

The production of a brown color and the reduction of the bitter principle in cacao are genuinely related processes. The bitter taste depends upon the presence of tannins, and the brown color has its origin in the oxidation of these tannins. It is easy to prove that an oxydase plays a part in the fermentation of cacao. If the cacao beans are heated the appearance of the brown color and the loss of bitterness alike fail, whereas after heating for an hour to 70° C. the change of color still takes place. The brown color can still be produced in beans heated to 75° C. if a small quantity of watery extract of fresh cacao beans is added. For comparison one may treat another portion of beans with a similar extract which has been previously heated to 80° to 100° and the change of color fails to appear. A similar brown color is produced in a pure solution of tannins by unheated cacao-bean extract, the discoloration commencing at the surface.

On the basis of these observations the following recommendations are made with regard to the practical treatment of cacao.

(1) In drying the temperature should not be allowed to rise above 60° to 70°.

(2) When fermentation is completed the cacao beans should be passed through a 5 to 10 per cent solution of potash before drying. In this way a removal of acid from the cacao is brought about which then encourages a further action of the enzyme and consequently a sweetening of the product. Cacao prepared in this way is also markedly more soluble and capable of suspension.

INDO-CHINESE RICE AND THE PHILIPPINE MARKET.

The Bulletin Economique for January-February, 1910, contains a very interesting note concerning the relations of the Philippines and Indo-China with regard to rice. Much of the information in the article is given by M. Bertrand, the French consul in Manila. Half a century ago, it is stated, there was not only enough rice produced in the Philippines to meet the needs of the people, but there was also a certain amount exported. But later, owing partly to the increase in the population and the preference accorded the cultivation of other products, and to numerous other causes, the exportation ceased, and the Archipelago soon began to import rice from neighboring countries, which it has been doing ever since.

Importation of rice from Indo-China began in 1872, but did not assume any great importance until 1885. At this time Indo-China, the British Indies, China (or more accurately Hongkong, and the rice exported from Hongkong was obtained from Indo-China, Siam, or Burma), and Siam, were all competing for this new market. Indo-China gradually assumed the chief place and has held it ever since except for the year 1900, when her exports of rice fell below those of China. Since 1900 the Philippines

have imported 2,017,619 tons of rice, representing a total value of 306,686,244 francs (about ₱122,674,497), of which Indo-China supplied 1,410,625 tons, with a value of 214,985,139 francs (about ₱85,994,055). Indo-China, then, has furnished 69.91 per cent of the quantity, and 70 per cent of the value of rice imported into the Philippines since 1900.

Regarding the tariff provisions recently enforced in the Philippines in connection with the importation of rice, M. Bertrand believes that no alarm need be felt, as this tax applies to all countries alike. The increased duty will not make any serious difference, for rice must be imported into the Philippines just the same, and attention is directed to the fact that the import duty is just as high on rice brought from America as that from other countries. The high cost of production of rice in America and the expensive freight rates will prevent any serious competition with the Indo-Chinese product in the Manila market. The danger to the Indo-Chinese rice trade, however, lies not so much in the possible increase in production in the Philippines as in the keen competition with Siam, Japan, and the British Indies. China is scarcely reckoned as important because on the whole she is an importer of rice, not an exporter. M. Bertrand does not anticipate any great increase in the production of rice in the Philippines, partly because the people are turning to other kinds of products which do not demand such hard labor, and yield a more immediate and higher profit, and because the cost of labor is increasing.

M. Lemarié, the present chief of the agricultural service, is of the opinion that the present trouble in the Islands is due to the shortage of draft animals, and that if the people apparently prefer other cultures to rice culture it is because these require fewer animals of this sort. When the stock of draft animals shall have been increased again, or when machinery shall have been installed in their place, he thinks that rice will once more assume its former important position.

Another authority, M. Fettere, chief of the commercial and industrial service, contends that the danger to Indo-Chinese rice traffic lies in the fact that the duty and consequently the price of rice has become so high that the consumption will decrease, and wheat and other products will be used to greater and greater extent in its place, since the duty on these products is so much lower.

TOBACCO IN THE PHILIPPINES IN 1908–9.

The following statement, furnished by the Collector of Internal Revenue, shows by provinces the area of land in the Philippines cultivated in tobacco and the amount produced during the year 1908, also the estimated production for 1909. These are the latest statistics available.

Provinces.	Number of growers.	Area of growers' land actually cultivated in tobacco.	Production.	
			1908.	Estimate for 1909.
		Acres.	*Pounds.*	*Pounds.*
Agusan		4.62	2,860	1,430
Albay	1	1.73	101	1,355
Ambos Camarines		14.57	10,188	10,188
Antique	26	23.88	13,966	13,706
Bataan			22	22
Batangas	25	108.73	53,004	44,347
Benguet		1.73	1,100	1,100
Bohol	381	125.11	107,118	110,310
Bulacan	11	31.32	13,517	9,117
Cagayan	10,288	14,341.17	8,974,306	8,800,000
Capiz	1,077	1,008.62	392,459	401,532
Cavite		.72	517	517
Cebu	5,425	11,858.35	6,480,531	7,785,930
Ilocos Norte	4,395	767.45	474,278	676,282
Ilocos Sur	1,466	447.22	247,504	390,861
Iloilo	1,244	1,366.65	732,689	1,117,927
Isabela	9,382	19,691.24	15,954,730	15,400,000
La Laguna		2.22	1,455	1,455
La Union	9,840	4,290.09	2,446,684	2,527,800
Lepanto-Bontoc		1.73	1,100	1,100
Leyte	375	325.97	83,640	80,054
Masbate		64.22	41,206	41,206
Mindoro		129.85	80,960	80,960
Misamis		43.23	27,830	27,830
Moro	298	577.16	28,512	29,791
Nueva Ecija	331	780.20	286,150	429,887
Nueva Vizcaya		3.36	2,200	2,200
Occidental Negros	584	1,222.97	556,261	559,478
Oriental Negros	1,250	1,065.88	620,424	648,639
Palawan				
Pampanga		4.20	2,589	2,589
Pangasinan	2,983	2,740.00	828,392	773,685
Rizal		2.47	1,661	1,661
Samar	85	152.03	57,754	55,847
Sorsogon			22	22
Surigao	160	32.93	14,566	13,669
Tarlac		213.75	137,676	137,676
Tayabas	234	160.06	47,201	77,517
Zambales		.42	268	268
Total	49,861	61,605.85	38,725,441	40,257,958

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

APRIL, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	14,170,289	9,022,935	3,782,236	177,647	250,701	4,988		27,408,796
	Value	Dollars	367,109	260,153	107,140	6,470	8,174	226		749,272
Beef cattle	Quantity	Number	3,189	90	61					3,340
	Value	Dollars	63,413	2,026	3,000					68,438
Hogs	Quantity	Number								
	Value	Dollars								
Sugar	Quantity	Kilos	221,760	8,150	1,316	6,601	8,196	63		246,086
	Value	Dollars	15,296	626	89	536	559	7		17,113
Coffee	Quantity	Kilos	53,753	970	4,434	102	3,336	6		62,601
	Value	Dollars	13,637	202	929	23	779	2		15,572
Cacao	Quantity	Kilos	92,062	3,016	250					95,328
	Value	Dollars	22,759	920	128					23,807
Eggs	Quantity	Kilos	280,214	248			832			281,294
	Value	Dollars	26,925	11			43			26,979
Raw cotton	Quantity	Kilos	23,591							23,591
	Value	Dollars	7,455							7,455

EXPORTS.

Hemp	Quantity	Kilos	15,475,063	2,757,570		3,444				18,236,077
	Value	Dollars	1,539,731	281,491		330				1,821,552
Sugar	Quantity	Kilos	10,189,055		9,799,983	581				19,989,619
	Value	Dollars	532,422		628,776	38				1,161,236
Copra	Quantity	Kilos	8,829,132	1,328,249	627,578		177,081			10,962,040
	Value	Dollars	797,675	132,049	57,516		16,625			1,003,865
Cigars	Quantity	Thousand	19,217							19,217
	Value	Dollars	393,816							393,816
Cigarettes	Quantity	Thousand	3,378							3,378
	Value	Dollars	3,155							3,155
All other tobacco	Quantity	Kilos	516,205							516,205
	Value	Dollars	125,045							125,045

THE ILOILO SUGAR MARKET.

By JOSÉ T. FIGUERAS.

APRIL.

The amount of sugar received in Iloilo from the fields and sugar mills during the month of April amounted to 282,536 piculs.

The quotation of 8 pesos and 6 reales [1] at the close of March continued until April 2, when the price dropped to 8 pesos and 5 reales. On the 5th it rose to 8 pesos and 6 reales, but dropped again the next day to 8 pesos and 5 reales. From then until the 14th no buyers were found, but on the 14th sugar was quoted at 8 pesos and 4 reales, from which it dropped on the 15th to 8 pesos and 3 reales, and on the 18th to 8 pesos and 2 reales, this price continuing steady until the close of April.

April shipments.

CROP 1909–10.

Date.	Vessel.	Destination.	Superior.	Wet.
			Piculs.	*Piculs.*
March 30	Indrapura	New York	76,800	
April 3	Ecclesia	Marseilles	6,800	
April 4	Strathspey	San Francisco	40,000	
April 8	Tringganu	Singapore	3,200	
April 14	Hudson	New York	32,000	
April 21	Harlow	United States	80,000	
Do	Sungkiang	Hongkong		486
Total for April			238,800	486

Exports up to April 24 for 1908 and 1909.

[In piculs.]

To—	1908–9 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	70,400		424,800	
Japan	8,000	5,915		
China	388,401		64,575	
Total	466,801	5,915	489,375	

[1] 1 real = about 12½ centavos.

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

APRIL, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar. Iloilo.		Rice. Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.9	------	27.4	------	27.8	------	27.8	------	26.4	------	27.2	------
2	27.7	1.8	27.5	5.1	28.0	------	27.6	------	26.2	------	------	------
3	24.9	30.2	24.6	34.5	26.4	3.8	29.0	1.3	26.3	------	28.4	------
4	26.3	13.2	25.5	7.3	27.0	------	27.0	------	26.4	------	27.9	------
5	27.3	0.8	26.3	16.5	27.0	0.3	27.9	------	26.4	------	28.2	------
6	27.4	4.0	26.2	2.8	27.3	0.5	28.6	------	26.5	------	27.6	------
7	26.8	8.9	26.9	------	27.9	0.5	28.0	------	26.8	------	27.6	------
8	27.4	------	25.8	9.0	27.4	0.3	28.4	------	26.8	------	28.2	------
9	26.3	64.5	26.0	18.0	27.7	------	28.9	------	26.6	------	29.4	------
10	27.0	0.3	27.2	------	27.7	------	28.0	------	27.4	------	29.2	------
11	27.8	------	27.0	------	27.7	------	29.0	------	27.4	------	27.6	------
12	27.8	------	27.3	------	27.3	------	29.8	------	26.6	2.5	27.4	------
13	27.6	6.6	27.0	8.7	27.3	------	30.2	------	24.9	35.3	28.0	------
14	26.9	7.4	26.0	29.7	27.8	0.3	29.9	------	26.0	------	28.8	------
15	27.7	------	27.4	------	28.3	------	29.6	------	26.9	------	29.4	------
16	28.0	1.3	27.2	------	28.0	------	29.5	2.0	27.0	------	28.5	2.0
17	26.9	------	26.9	1.3	27.6	------	30.4	------	27.3	------	28.2	------
18	26.2	------	28.0	------	27.5	------	30.8	------	27.8	------	28.3	------
19	26.7	------	27.7	------	27.6	------	29.8	------	27.2	------	28.7	------
20	26.4	------	27.3	4.3	28.0	------	31.0	56.4	26.6	------	29.4	------
21	27.2	------	27.2	56.1	27.6	5.8	28.6	------	26.6	------	28.8	------
22	27.2	17.1	24.7	40.8	25.3	6.4	28.7	------	26.0	2.3	------	------
23	26.1	29.2	26.6	0.5	25.5	4.8	29.4	1.3	26.4	------	27.6	------
24	26.2	3.3	27.5	0.8	25.5	4.7	25.4	20.8	26.5	0.5	29.1	------
25	26.5	4.3	27.9	0.8	28.8	------	23.6	3.5	24.6	4.3	28.3	2.5
26	28.4	10.2	27.6	------	28.2	------	28.0	------	25.7	6.3	29.0	------
27	28.1	------	27.8	8.6	28.4	------	28.6	0.2	25.6	8.1	------	0.8
28	27.9	4.0	26.6	4.6	28.2	------	28.9	------	26.5	------	28.0	------
29	27.8	3.8	26.1	11.2	28.5	0.8	28.6	------	27.5	------	29.2	------
30	27.8	2.1	26.8	0.8	28.2	------	28.7	------	27.8	------	29.2	------

CURRENT PERIODICAL LITERATURE.

ARTICLES IN CURRENT PERIODICALS, ETC., THAT MAY BE OF INTEREST TO AGRICULTURISTS IN THE PHILIPPINES.

RUBBER.

The Rubber Industry in Mexico, by Dr. Pehr Olssen-Seffer, in *Tropical Life,* March, 1910.

New Sources of Rubber in Mexico, according to Charles P. Fox and Pehr Olssen-Seffer, in *Tropical Life,* March, 1910.

Manihot Rubber Trees, V. Effect of nitrate of soda upon the flow of Ceara latex (Extract from Bulletin No. 19 of the Hawaiian Experiment Station), in *Tropical Life,* March, 1910.

Cultivation and Production of Rubber in the German Colonies, by Dr. Paul Preuss, in *The Tropical Agriculturist,* February, 1910.

CACAO.

Plantaciones mixtas de Cacaoteros y Árboles de Caucho, por M. O. Labroy (in Boletin del Ministerio de Fomento de Venezuela), reprinted in *El Hacendado Mexicano,* Abril 1, 1910.

Cacao, by J. H. Hart. A continued series of articles appearing in *The West India Committee Circular,* beginning July 2, 1909.

MISCELLANEOUS.

Efficiency of the "Hadi Process" of Sugar Manufacture, by G. Clarke and S. C. Banerjee, in *The Agricultural Journal of India,* January, 1910.

Experiencias sobre el Abonado del Tabaco, por A. A. de Ibera, in *La Hacienda,* March, 1910.

Vanilla Culture for Tropical Queensland, by Howard Newport, in *The Queensland Agricultural Journal,* April, 1910.

Tillage of Soil, Editorial in *The Agricultural Bulletin of the Straits and Federated Malay States,* March, 1910.

Coöperation, by E. V. Wilcox, in *The Hawaiian Forester and Agriculturist,* March, 1910.

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EDITORIAL.

THE VETERINARY CORPS.

Dr. Archibald R. Ward, the new chief veterinarian of the Bureau of Agriculture, arrived in Manila on July 2 and has assumed his duties as chief of the veterinary corps. Doctor Ward, in coming to the Philippine Islands, has given up an important professional position in the University of California, where he had attained a reputation which placed him among the leading veterinarians of America. His liberal education, wide experience, and extensive travel eminently fit him to undertake the administration of the veterinary work of these Islands. The position which is now filled by Doctor Ward has existed for two years, during which time it has been temporarily filled by the detail of a veterinarian from the regular corps. The acting chief veterinarian during this period has been Dr. Frank C. Gearhart, who has handled the work of the veterinary division

in a most creditable manner, as shown by the excellent results that have been obtained during his administration.

The veterinary corps was organized some ten years ago, in the early days of the Civil Government, and was for a time connected with the Bureau of Science. This arrangement did not prove satisfactory, and it was transferred to what was known at that time as the Board of Health, which was under the administration of an army physician, who was detailed as chairman of the Board of Health in charge of the suppression of human diseases. This arrangement continued until November 1, 1905, when the Reorganization Act went into effect. One of its provisions was the transfer of the veterinary corps to the Bureau of Agriculture.

At that time the force consisted of nine veterinarians and about twenty other employees, the most of whom were known as "inoculators." The manufacture of antirinderpest serum, examination of microscopic specimens, and much other of the technical work of the division was still retained by the Bureau of Science. On January 1, 1907, the Director of the Bureau of Science transferred to the Bureau of Agriculture the serum herd and everything pertaining to the manufacture of serum, except the filtering, bottling, and testing. In 1907 plans were perfected for the removal of the serum herd to the new serum farm about 20 kilometers from the city of Manila. Considerable difficulty had been experienced in preventing the animals in the serum herd from contracting complicating diseases when they were kept in the city. The necessary buildings were erected and the herd moved to the new location during the month of October, 1908.

The veterinary force was increased during the three years following its transfer to the Bureau of Agriculture until, during the first half of 1909, there was a total of eighteen veterinarians. An estimate was submitted for the fiscal year 1910 that called for a greatly increased appropriation for the work of the veterinary corps, including an increase of the force to forty veterinarians. The entire number was allowed, and the increased force was appointed and entered on duty in the Islands during the first three months of the fiscal year 1910. At the same time arrangements were perfected for increased facilities in every direction in proportion to the increased veterinary force. The amount of serum produced per annum was increased from about 2,500 liters to over 16,000 liters. Steps were also taken to establish a satisfactory system of local quarantines in the infected centers.

These increased facilities, together with the introduction of

the new policy of excluding the further importation of diseased animals into the Islands, have resulted in the rapid suppression of the three principal diseases against which the Government has been waging a campaign for the past ten years. Foot-and-mouth disease has been entirely eradicated, and there remain but twenty-five municipalities infected with rinderpest and fifteen with surra. The course to be followed from now on will be that of absolutely exterminating these diseases in the shortest possible time, and all efforts will be concentrated toward the accomplishment of that end.

THE EXCLUSION OF DISEASED CATTLE.

When General Order No. 15, which is being published in this number of the REVIEW, went into effect, it marked a turning point in the history of animal diseases in the Philippine Islands. For nearly twenty-five years rinderpest has prevailed here, and during recent years both surra and foot-and-mouth disease have gained a strong foothold.

For the past ten years the imports of live stock into these Islands, mostly from the Chinese Empire, have been from forty to fifty thousand head of cattle and carabaos per annum. During the past three years practically all shipments of live stock that have arrived here from China have been infected with one or more of the above-mentioned diseases. More animals thus imported into the Philippine Islands have been affected with foot-and-mouth disease than with either of the other two diseases named; but the constant introduction of rinderpest infection by means of these importations, has been the most prolific source of this disease, and has been the most serious menace to the live-stock interests of this country.

There have been two conflicting interests always present; one, the demand for more cattle to replace those that had died of disease; the other, the constant reintroduction of diseases against which a campaign was being waged. All parties concerned have exerted every possible effort to secure such action on the part of the Government as would be favorable to their own special interests. The men who have made the strongest demands for the privilege of importing cattle, even though it was known that such cattle were constantly bringing in disease, have been the cattle dealers of Manila.

The policy of the Government for the past ten years has been to permit the importation of live stock under certain restrictions, even though it might be infected. At the time that the Bureau

of Agriculture was transferred to the Department of Public Instruction, this matter was taken up for consideration with the result that the policy was changed so as to prohibit the bringing into the Islands of infected animals.

General Order No. 15 had the immediate effect of excluding infected cattle coming from the ports along the China coast, although it did not exclude cattle coming from Indo-China. There is now developing an extensive cattle business between Australia and the Philippine Islands which promises to supply the demand for slaughter cattle in the Philippines. The larger part of the animals imported for work purposes are carabaos coming from the vicinity of Saigon, Indo-China.

With the prospects as bright as they are at the present time for the entire suppression of contagious diseases of animals in the Philippine Islands, there is reason to believe that the native animals will increase to such an extent as to largely take the place of the supply previously imported.

The new policy of the Government with respect to the exclusion of animal diseases, and the guarding of the live-stock industry so that the supply of live stock of the Islands may be replaced by local production, is one that should receive the heartiest approval and support of all.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF PUBLIC INSTRUCTION,
BUREAU OF AGRICULTURE.

MANILA, P. I., *May 14, 1910.*

GENERAL ORDER
No. 15.

In accordance with the provisions of a letter from the honorable the Secretary of the Interior, to the Director of Agriculture, dated Baguio, April 25, 1910, and with the provisions of Act 1760 of the Philippine Commission, the following rules and regulations governing the importation of domestic animals into the Philippine Islands are hereby promulgated:

1. Whenever animals imported into the Philippine Islands from foreign ports upon arrival in any port are found to be suffering from, infected with, or exposed to any dangerous communicable animal disease, the landing of animals in such shipment will not be allowed, but they with all the effects pertaining to them must be removed from the Philippine Islands.

2. If animals imported into the Philippine Islands from any foreign port considered and declared by the Director of Agriculture to be infected with dangerous communicable animal disease arrive apparently free from such disease they will be permitted to land ten days after their departure from the port of origin, provided no disease has appeared among them during this period. Permission will be given for the transfer of such animals from the vessel on which they arrive to lighters, cascoes, or other suitable vessels, where they will be held until the above-mentioned ten days shall have elapsed; or, if any such animal disease appears, until they have been free from disease for a period of ten days, when they may be brought ashore.

3. Animals imported into the Philippine Islands from a noninfected port of any foreign country, in which country any animal disease is known to exist, may be landed immediately upon arrival if found free from dangerous communicable animal disease, and will be quarantined on shore until ten days shall have elapsed from the date of embarkation.

4. Animals imported from foreign countries where rinderpest, surra, and foot-and-mouth disease do not exist may be landed immediately upon arrival, if found free from dangerous communicable animal disease, and will not be held in quarantine unless exposed to infection after arrival.

5. The provisions of this general order shall become effective on and after June 1, 1910, and shall supersede all portions of General Orders Numbered 13 and 14 in conflict therewith.

G. E. NESOM,
Director of Agriculture.

Approved:
NEWTON W. GILBERT,
Secretary of Public Instruction.
BAGUIO, *May 17, 1910.*

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF PUBLIC INSTRUCTION,
BUREAU OF AGRICULTURE.

MANILA, P. I., *May 20, 1910.*

PORTS DECLARED BY THE DIRECTOR OF AGRICULTURE TO BE INFECTED WITH ANIMAL DISEASES.

Notice is hereby given that in accordance with the provisions of Act 1760 of the Philippine Commission and General Order No. 15 of the Bureau of Agriculture approved by the honorable the Secretary of Public Instruction, May 17, 1910, the undersigned hereby declares the ports of Hongkong, Amoy, Shanghai, and other ports along the Chinese coast, either on the mainland or adjacent islands, to be infected with a dangerous communicable animal disease or diseases within the meaning of Act 1760 and General Order No. 13 of the Bureau of Agriculture. Therefore all cattle and carabaos shipped to the Philippine Islands from the ports or places above referred to shall be handled in accordance with the provisions of sections 1 and 2 of said General Order No. 15.

C. E. NESOM,
Director of Agriculture.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
EXECUTIVE BUREAU.

BAGUIO, *May 3, 1910.*

EXECUTIVE ORDER
No. 36.

1. The attention of all Insular, provincial, and municipal officials concerned is invited to the provisions of Act Numbered Two hundred and sixty-two, providing for the interment or burning of the bodies of animals which die having rinderpest and prohibiting the sale or use of any part thereof; of Act Numbered Eleven hundred and fifty-six, providing for the marking of animals afflicted with surra, and of Act Numbered Seventeen hundred and sixty, making provisions to prevent the introduction into the Philippine Islands of dangerous communicable animal diseases to prevent the spread of such diseases within the Islands, and so forth. Copies of these Acts and of all rules and regulations governing the subject-matters therein dealt with will be furnished in either English or Spanish on application to the Director of Agriculture, Manila.

2. The attention of all provincial officials concerned is called to the provisions of section thirteen (*k*) of Act Numbered Eighty-three, as amended by section six of Act Numbered One hundred and thirty-three, making it the duty of the provincial board to adopt, by resolution, regulations for the suppression of any agricultural pest like locusts or cattle disease, to provide for enforcement of the same by fixing penalty for their violation, and so forth.

3. The attention of all municipal officials concerned is drawn to the provisions of section thirty-nine (*m*) of Act Numbered Eighty-two, making it the duty of the municipal council to regulate the keeping and use of animals, in so far as the same affects the public health and the health of domestic animals, and to the provisions of section thirty-nine (*s*) of Act Numbered Eighty-two, providing that the municipal council shall adopt such measures to prevent the introduction and spread of disease as may, from time to time, be deemed desirable or necessary.

4. Municipal presidents should immediately report the appearance of any contagious disease, or any unusual number of deaths among domestic animals, to the provincial governor, and where practicable should also send a copy of such report to the provincial veterinarian or the nearest local representative of the Bureau of Agriculture. If there is a probability of considerable delay in the report reaching the provincial governor, it should be made direct to the Director of Agriculture, Manila, and a copy thereof should be sent to the provincial governor. The telegraph should be used in all emergencies.

Sick animals should be immediately isolated in such locality so that they will not come in contact with other animals, people, or anything that may serve to spread the disease; guards should be placed over them, and their former location should be thoroughly disinfected to prevent the spread of the disease. Whenever an employee of the Bureau of Agriculture confirms a reported outbreak and notifies a president of a municipality that a contagious disease exists there and states that quarantine corrals are essential for the control of such disease the president shall take the neces-

sary steps to have constructed, in accordance with plans and specifications furnished by the Director of Agriculture, in such barrios as may be deemed by the veterinarian as necessary, the required number of corrals to hold all infected animals which said veterinarian may order placed in quarantine.

Caretakers should be placed in charge of each corral to feed and water the animals contained therein. No one else should be allowed inside the corral except those having a pass issued by an employee of the Bureau of Agriculture. Policemen should be detailed to guard these corrals and to see that no animals are taken out without permission from an employee of the Bureau of Agriculture, and that everyone entering the corral be disinfected before leaving it.

When it is so requested by the employee of the Bureau of Agriculture, presidents should order all animals of the class designated by said employee to be assembled for inoculation or examination. Orders should be issued that all animals of the class affected in an infected barrio be tied or confined and not allowed to run loose. Certain policemen should be designated whose exclusive duty it shall be to constantly inspect the animals of the municipality and, when a contagious disease is declared to exist in a municipality by an employee of the Bureau of Agriculture, as many policemen as can possibly be spared should be detailed to assist in the eradication of the disease by maintaining quarantine and inspecting barrios. Orders should be given that the animals in an infected barrio should not be watered at a common watering place. Municipal officials are expected to enforce such quarantines as are prescribed by the Director of Agriculture.

5. Provincial governors should immediately and simultaneously report all outbreaks of contagious diseases to the Director of Agriculture, Manila, and to the provincial veterinarian or nearest local representative of the Bureau of Agriculture.

Whenever an outbreak of contagious disease is confirmed and reported to the provincial governor by an employee of the Bureau of Agriculture, such governor should immediately notify all municipal presidents in his province, stating the municipality in which the disease exists and instructing them to adopt the necessary measures to prevent the introduction of any disease into their municipalities from the infected district.

6. Municipal presidents should on receipt of this executive order prepare an accurate statement of the domestic animals in their respective municipalities, giving the name and the address of the owner and the number of animals of each class, the location where they are kept, and the name and address of the caretaker when he is other than the owner. This list should be made in triplicate, one copy to be placed on file, one furnished to the provincial governor, and one furnished to the Director of Agriculture or provincial veterinarian. These lists should be revised subsequently every six months, on the first of January and the first of July of each year, and copies furnished as provided for above.

7. Failure to comply with the provisions of the laws, rules, and regulations or executive orders governing this matter will subject the responsible official or officials to administrative proceedings for their removal or removal and disqualification from holding any public office according to the gravity of the case.

W. CAMERON FORBES,
Governor-General.
By THOMAS CARY WELCH,
Acting Executive Secretary.

MINUTES OF THE AGRICULTURE CONFERENCES HELD DURING THE PHILIPPINE CARNIVAL, FEBRUARY 7 TO 10, 1910.

(Concluded.)

FEBRUARY 9.

Morning session.—On Wednesday, February 9, the Agricultural Conference opened at 9.15 a. m., with Professor Conner, Assistant Director of Agriculture, as presiding officer. Sr. Manuel Roxas opened the session with an address on "Coconut Growing in the Philippines," after which some questions and comments arose. Sr. Lopez inquired as to whether planting sugar cane in connection with a coconut plantation would have a bad effect on the coconuts. Sr. Roxas was of the opinion that if the sugar cane were carefully weeded and the plantation kept in the best possible condition, it might be grown near coconuts with no great danger, but that under ordinary conditions the cane would harbor insects harmful to the coconuts. He said that such had been the result when coconuts and sugar were planted together at the college at Los Baños. Sr. Tiangco stated that he also had found that sugar cane harbored insects harmful to coconuts to such an extent that many of the coconuts were killed by them.

One of the delegates next inquired as to how many varieties of coconuts are now cultivated in the Islands. This question was referred to Doctor Copeland, who replied that it was impossible to state the exact number at that time. He said that in Indo-China there are said to be 22 varieties recognized, and that possibly about the same number exist in these Islands.

Sr. De la Rosa then spoke of the difficulties attending the raising of coconuts on land infested with cogon grass, and asked if there was anything to be done aside from burning the grass, as in burning it the coconut trees were in danger of being injured and the coconut beetles would be able to attack the trees through singed and burnt places. Doctor Copeland suggested that this might be avoided by planting other crops among the trees, which would yield enough to meet the expenses of cultiva-

tion. Where it is not desirable or possible, however, to cultivate other crops in this way, a bare place having a radius of at least a meter should be cleaned around each tree before the grass is burned. This will protect the trees from scorching while the cogon is being burnt off. Sr. De la Rosa then asked if soil on which cogon grows is suitable for the growing of coconuts, to which Doctor Copeland replied that this grass is found in nearly all kinds of soil.

The question of the increased production of coconut trees near the sea next arose. Sr. Abad remarked that according to his experience the trees grown near the sea were much more productive than those planted inland, even though the soil by the sea was not so rich. Doctor Copeland said that this varied with the locality, and spoke of the groves in Laguna Province which are nowhere near the sea, but which flourish at a considerable altitude. The effect of the sea breeze was spoken of, and the stimulation afforded the plant by the salt atmosphere produced by the breeze. Sr. Abad said, in addition, that he had found that coconut trees on the shore were less liable to attacks of insects than those planted in the hills, and asked why this should be so. Doctor Copeland answered that one reason might be that the insects could not attack from as many sides when the trees skirted the shore and were exposed to the steady breeze; he also stated that it was necessary to keep the plantations, especially inland plantations, clean and in excellent condition, so that there would be nothing near to harbor beetles and other destructive insects.

Sr. Madrigal wished to know whether young coconuts needed shade or not, and Doctor Copeland replied that while the newly planted seed should ordinarily have some protection from the sun, where the soil is very good this shade is not absolutely necessary. The advisability of planting other crops, such as cacao and annatto, among the trees on the plantation was questioned, and it was decided that it would be better not to plant other trees which might interfere with the coconuts. Leguminous plants were mentioned as desirable, however, because of their power to enrich the soil. The raising of cacao or annatto alone would require the planter's entire time and attention. The necessity for keeping a plantation of any kind in the best possible condition was strongly emphasized.

At this point the session was suspended in order that the delegates might be photographed, after which the discussion on coconut growing proceeded. Sr. Matías desired some information regarding the selection of seed coconuts. He stated that

according to his observations 25 to 30 per cent of the trees the seeds of which have not been properly selected die at the age of ten or twelve years even though not attacked by any disease or insect. Doctor Copeland replied that he had heard this statement made before, and would be glad to investigate the matter. Sr. Matías believed that the seed selected from the older trees yielded better results, but Doctor Copeland thought that if a tree lived for a number of years and then died, there must be some more immediate cause, possibly a disease which we do not know about as yet. The prevalence of this trouble in the Province of Albay was commented upon.

Doctor Ocampo asked what kind of soil the coconut requires, especially if it can be grown in clay soil. Doctor Copeland thought it was more particularly a question of sufficient water and food than of the nature of the soil. Alluvial lands were mentioned as especially favorable for the coconuts' growth. Doctor Ocampo asked further why some coconuts have thick meat while that of others is thin, and Doctor Copeland said that probably it was due to insufficient nourishment in some cases and in others to the seed planted. If *macapunó,* or fruit full of meat, is desired, seed must be taken from trees that yield *macapunó.*

The value of the husk of the coconut to be used for seed was next discussed. Doctor Ocampo wished to know if it was necessary to preserve the husk, and Doctor Copeland replied that while it was not absolutely necessary it was desirable, because the husk preserves the water, and unless the soil is moist this is valuable. In some cases the husk may prove an obstacle to the growth of the young plant, and many planters cut a small hole in the husk so that the young palm may grow out more easily.

The time allowed for the discussion of the paper on coconuts having passed, the next subject on the program, "Rice Growing in the Philippines," by Mr. Apostol, was announced.

At the close of this paper Sr. Carrillo asked what means might be employed to protect rice from the worms which attack it in the rainy season. Mr. Apostol stated that he could not tell as yet what would be best to do, but he believed that the use of good clean water for irrigation and careful cultivation of the land will help. Trouble from this source usually occurs when the season is irregular or the land is in bad condition. Mr. Apostol said that investigations along this line are at present being conducted by the Bureau of Science.

Doctor Ocampo stated that he had observed that the worms are present in great numbers when the water is allowed to stand

over the rice paddy and is not in motion. If the water is drained off and the ground allowed to dry, the worms die. He also said that he had succeeded in killing them by mixing lime with water and applying this. Mr. Apostol said that in some places the land is worked up during November or December, after the harvest, to sweeten and clean it.

Sr. González stated that in Pangasinan the practice is to grow mongo, which cleans the ground, and in other cases the planters take only the heads of the rice and leave the straw to dry, which is then burnt off, also destroying the grass. This latter method does not result in complete extermination of the grass, however, for it grows again the next rainy season.

Doctor Liongson then described the method in use in Pampanga. It consists in plowing the land in May or June, after the rains have commenced and the grass has begun to grow. The land is then flooded with water for a week or more, which results in rotting the upturned grass roots. At the end of this time the water is drawn off and the roots are raked up and later burned. The rice paddy is then ready for the young rice plants.

At this point the session adjourned for the morning.

Afternoon session.—The afternoon session opened at 3 p. m. with Professor Conner as presiding officer. Mr. Borja opened the discussion with a paper on the "Varieties of Rice Grown in the Philippines." At the end of this paper Sr. Zamora asked how much *inacupanga* might be expected from a hectare, to which Mr. Borja replied that in the experiments he had been conducting, in which the seed was planted on June 15 and harvested on November 9, the yield was 17 cavanes [1] per hectare. Mr. Borja stated that the experiments in which he had been engaged had revealed that the apparent number of varieties is greatly exaggerated, and of 500 so-called varieties, the greater number were not varieties at all, but duplicates. The main object of the experiments had been to determine the proper time for transplanting and harvesting each variety, and the yield that might be expected. In reply to Sr. Zamora's inquiry as to whether *inacupanga* planted in irrigated land yielded as well as when it was planted in the upland, Mr. Borja replied that it did not. This variety, he said, was much better suited to the upland.

The next subject on the program was Doctor Nesom's address on "Sugar Cane Growing in Hawaii and the United States" (published in the REVIEW for June). At the conclusion of Doctor Nesom's address Sr. Liongson asked how many hectares

[1] 1 cavan=75 liters.

are under sugar cultivation in Hawaii, to which Doctor Nesom replied that there were about 40,000 hectares under cultivation, yielding from 10 to 11 metrical tons of sugar per hectare.

After some general remarks and announcements the session closed for the day at 4.15 p. m.

FEBRUARY 10.

The morning session on February 10 opened with Doctor Nesom as presiding officer, and the first number on the program was Mr. M. M. Saleeby's talk on "Maguey Cultivation in the Philippines." This was followed by Mr. Toribio N. Vibar's account of the College of Agriculture at Los Baños. The next papers were on "School Gardening in the Philippines," prepared by Mr. S. C. Kelleher and Mr. North H. Foreman. After these addresses Doctor Nesom announced that the formal program of addresses prepared for the conferences had been concluded. He thanked those present for their interest and attention, and commented upon the unusually large number of people present throughout. Doctor Nesom said that he felt sure that the conferences had resulted in great and lasting benefit both to the farmers and the Bureau of Agriculture, and assured those present that the Bureau stood ready to render all possible assistance to the agriculturists in the Islands.

The formation of an Insular Agricultural Association was then discussed. Some explanations were made as to the nature of such an association, which should have for its object the improvement of agricultural conditions and the protection of the farmers. In order that all might work together and with mutual understanding, annual agricultural conferences, such as the one then in session were considered desirable, and it would be the duty of the association to arrange for these. It was decided to have a president, first vice-president, and secretary, and that each province represented should have a vice-president. This was agreed upon and Dr. G. E. Nesom, Director of Agriculture was elected president, Prof. C. M. Conner, Assistant Director of Agriculture, was elected first vice-president, and Mr. E. A. Coddington, secretary. It was decided that the president and secretary should prepare a constitution and by-laws, to be submitted to the vice-presidents in the various provinces for their approval. After the approval of a resolution thanking the Carnival Association for courtesies shown during the sessions the conferences were declared adjourned by the president.

The resolutions presented by Mr. Joaquín González, Doctor Ocampo, and Mr. Sandiko, committee on resolutions, will be printed in another number of the REVIEW.

THE PHILIPPINE TOBACCO QUESTION FROM AN EDUCATIONAL STANDPOINT.

By Pius E. Burns,

Division Superintendent of Schools for Cagayan.

I have been asked on several occasions by officials of the Government and, more recently, by men representing capital to say something regarding the general tobacco industry of the Cagayan Valley and more particularly regarding some plan by which a better quality of tobacco can be produced.

THE TOBACCO REGION OF THE CAGAYAN VALLEY.

The Cagayan is the largest river valley in the Philippines. There are still thousands of acres of this territory not occupied, and everything possible should be done by the Government to assist local officials in encouraging the coming in of both capital and labor, the improvement of transportation, and the education of the people in planting, cultivating, and harvesting the crops and in the sale and distribution of the products. The possibilities of this section are enormous.

The famous tobacco region in this territory extends from Alcala to Cordon along the Cagayan River, a distance of 130 miles, and besides this there is the beautiful Magat Valley, from Reina Mercedes to Bayombong; the rich Chico Valley, from Nassiping to Taboc; the wide Pared Valley, from Alcala to Bacagan, and the five Pinacanauan Valleys, all small as compared with the others, but having fertile soil and favorable climatic conditions. The total length of all these valleys which will produce tobacco exceeds 250 miles and they vary in width from 1 to 10 miles. Great mountains rise on each side of these valleys, reminding one of our own western country in the United States.

THE TOBACCO WORKERS.

There are more than 20,000 little tobacco fields or *sementeras* in the Cagayan Valley, with probably at least five people interested in each field, making over 100,000 people here who are interested in tobacco. This number includes more than 10,000

school children. Of these 10,000 school children it is safe to estimate that for some years to come at least 80 per cent will go no further than the primary schools, that is, not far enough to become teachers or civil-service men or skilled artisans of any kind; in other words, this 80 per cent will return to the farms.

Now, when they return to the farms they will have to depend, either for a mere existence or for a competence and a flourishing livelihood, upon two crops—corn and tobacco. These crops are usually raised alternately, during the same year. Tobacco is transplanted in December and January, after the floods and the wet season are over, and corn is planted after the tobacco harvest, during the summer rains of June and July. The people eat most of their corn, selling a little to those living in the towns, particularly those who have horses. The growers depend upon the sale of their tobacco to buy the other necessities which they can not produce. The yield of both corn and tobacco is usually small and the quality inferior, and the people who depend upon these crops are, as a rule, very poor. In some cases they are so destitute that the children can not be furnished with the proper clothing to attend school.

THE PRESENT EDUCATIONAL SYSTEM.

It being granted that 20 per cent of the school children will reach such a standard of training that they will be amply fitted to care for themselves, there still remains 80 per cent that must be looked after if we expect to improve their condition over that of their parents.

We school people have formulated and are trying plans which we believe will be a success. First, there is a simple primary education offered even to the poorest of nearly every barrio—English, reading, writing, arithmetic, and geography—which at once gives the child advantages which have never before been offered. Second, there are school gardens where the rudiments of horticulture are taught in a practical way: How to sow, water, and cultivate; how to fight simple pests; the advantages of raising a few garden products; and tree planting. Third, there is the simple industrial work of all kinds performed by school children, such as hat making, mat making, simple stool and chair making and, in some places, weaving. Also, for the girls, there is sewing and in some few favored barrios simple lessons in cooking. Fourth, laws of health and simple sanitation are taught and the children are given training in physical culture. In general, system, order, and decency are taught together with all study, work, and play.

But, after from two to four years, most of the children who have been busy in school must return to their homes and begin the struggle of life. They must help to make a living for themselves and others, that is, to produce something from the soil which can be exchanged for money or its equivalent. Environment is strong and wields a wonderful influence, and although a child may have had years of excellent training his natural inclination will be to fall back into the *costumbre* of his parents and do just as they have always done. For, although it is true that he has learned many useful things, it is not likely that he will always remember them, or have the courage and desire to apply them in a practical way.

If children, by a retrogression due to indifference and environment, lose much of this excellent training given them during their early years, what other and more important training can we introduce into the primary school among these "short-term learners" that will prove of lasting and vital value through life? The answer is as natural as it is simple, viz, Train the child in those things upon which his vital existence, usefulness, and citizenship depend. In some places in these Islands training in weaving should be given special attention; in others, the culture of silk; and, if our premise is correct, in *this* valley we must give special training in the production of corn and tobacco—two of the most important crops. Emphasis should be placed on tobacco culture, for the simple reason that at present and for some years to come tobacco will bring in most of the available money; and money, after all, is what makes everything most prosperous.

THE CRITICAL PERIOD FOR FILIPINO TOBACCO.

The Philippine tobacco industry is now passing and must pass for the next few years through a very critical period, and the price our tobacco will command in the new markets of the United States depends on what can be accomplished during this period. After a long fight, a certain amount of tobacco may now enter the United States without duty. In order to maintain our new market we must improve the present condition of the Philippine tobacco industry, first, by introducing proper methods of seed selection, cultivating and curing; and second, by increasing the production of fine, thin, first-grade wrapper tobacco. The present unsatisfactory conditions should not be attributed to climate and soil, for both of these are very favorable. The people must be taught to use improved methods. They, of themselves, in many cases poor, ignorant, and following blind custom, will not change. They apparently prefer to

raise an inferior, fifth-grade tobacco that sells for ₱1 or ₱2 per *fardo* [1] instead of a first grade that is worth ₱15. It will not take a large amount of first-class, fine tobacco for wrappers, and it is not necessary that this be light in color, as color, contrary to former traditions, does not signify strength or goodness. Probably 5,000 quintals [2] of fine wrapper per year would be enough to supply our local manufacturers. This amount could perhaps be found at the present time in the green plant, but, owing to the crude methods of harvesting and curing, much of it is spoiled before it reaches the factory.

If, by placing on the market an inferior tobacco, with a coarse-veined wrapper, packed with musty and worm-eaten filler, we lose the trade we have already gained, it will take many years of toil to regain it and restore the market confidence even with a *better* grade. With orders coming in, as they now are, for several millions of cigars per month it is not an easy matter to refrain from filling these orders even with poor tobacco if necessary, yet wisdom assures us that this would be absolute folly and almost a crime.

PLAN OF EDUCATIONAL CAMPAIGN.

A tobacco primer should be put into the hands of every child in the third and fourth grades. This book must be simple in language and well illustrated, showing both good and bad methods of cultivation, and must apply absolutely to conditions here. It might be translated into the native dialect, and although many could not read even that, yet the habit of finding out what was in the book would grow. It should be taught to all "short-term learners," those boys and girls who will perhaps go no further in school life than the primary, and will of necessity return to the farm for a living. But this book, while its results are sure to be good even when taught by the average Filipino teacher (and many of our teachers here have a practical knowledge of tobacco), will not suffice alone. Even educated people learn how to do by doing, and this is doubly true of the untrained and ignorant.

An American educator and expert tobacco man should have charge of the entire tobacco region. He should be assisted by at least eight subsupervisors, bright and well-schooled Filipinos already knowing much about tobacco and willing and anxious to know much more. The American expert should get these assistants together in a little school or circle and in a practical way outline for them the following subjects: Seed selection,

[1] A fardo contains 400 leaves.

[2] 1 quintal=46 kilograms.

seed beds, plant selection, transplanting, hoeing, plowing, cultivating, worm gathering, ordinary diseases and simple remedies, covering of tobacco, leaf selection, drying sheds, proper fermentation, simple heat and thermometer work, assorting, proper packing, scales of prices, and other kindred topics.

This instruction should be in the form of simple lectures or talks, lasting, say, five to fifteen minutes. Then each subsupervisor, when he is sure he understands the scheme as outlined, should repair to his particular district (in our case to a regular school district already presided over by an American teacher) and begin with the three sets of persons he must deal with for the time, that is, barrio teachers, pupils, and tobacco farmers.

With the pupils he may begin instruction at once, having them plant a seed bed near the schoolhouse, and with a small amount of tobacco for illustrative purposes, he may begin his simple talks or help them with their primer. On Saturdays the subsupervisors can instruct a few barrio teachers, outlining the next week's work, and once or twice a week he can give a talk to the farmers in the evening. He can also now and then go out into a field or drying shed, where it is not uncommon to find a large number of men, women, and children at work on a very small area, and there give some practical suggestions regarding the care of tobacco.

Thus all will begin to gain a better knowledge of tobacco culture: The American expert will soon become more practical; the subsupervisors will gain experience through acquaintance with the people and conditions; the barrio teachers, in teaching the primer and reading the lectures, will become conversant with the important facts of the tobacco plant, its life and growth; and the children themselves will absorb tobacco learning together with their other study, work, and play.

This plan is a simple one and can be put into operation within a few months. The province can furnish the tobacco and seed for experiment and demonstration, the Insular Government can furnish the working force, and the amount of good this force could do in the next few years can hardly be estimated—provided that the demands of the American market can be maintained.

CORRELATION WITH OTHER SCHEMES.

The above scheme naturally suggests two others that are similar and yet, in a way, quite different. The first is an agricultural experiment station situated, for example, in Isabela on some well-known tobacco ranch or hacienda. This station should have sufficient land, together with the necessary implements and

work animals, and could be worked by ordinary farm laborers supervised by an expert tobacco man. This farm can be established and maintained at a nominal cost, as the Government already owns land that was used during Spanish times as an experiment station. The location should be near an available supply of timber. The nucleus of a little school of lectures and practical demonstrations on the tobacco business, from seed to factory and world market can thus be formed of students and interested persons. It is probable that large growers would send their field foremen to this station for instruction, and that people of some means would come or send their sons, and thus some practical and scientific training would gradually be acquired which would, in the course of time, be disseminated throughout the province.

The second scheme is that the Insular Government should erect fifteen or twenty drying sheds on some of the best fields and ranches. These sheds need not be large, but should have strong posts set in cement and an iron roof to resist the fierce typhoons which are of almost yearly occurrence. If the planter is convinced that he will get a "square deal," it is believed he can be induced to place his choicest leaves in these sheds. This matter must be very carefully and accurately looked after from the beginning in order to gain the confidence of the people. The supervision of the sheds will require one expert American with as many bright and honest Filipino assistants as there are sheds. Each grower should have a separate compartment, or his leaves should be counted, and at the proper time returned. These sheds should be erected in readiness for next season's crop of tobacco. It is probable that almost enough good leaf could be stored in these sheds from year to year to supply the local demand for wrapper tobacco. As before stated, much good wrapper is grown but most of it is spoiled in the curing. These sheds should solve this difficulty and give good results at once. They will cost a considerable amount, but their output would in a few years justify the expenditure.

We must supply the American market with a good quality of tobacco, and if the manufacturers and exporters are allowed to crowd any and all grades of tobacco on the market, there is liable to be a decline in the demand for the Philippine product, and the fame that the Manila cigar now enjoys will be ruined. We need not import Sumatra or Cuban tobacco into these Islands and blend it with our own product, when we have thousands of acres of rich land that are capable of producing a quality of tobacco that will equal if not surpass that grown in Sumatra and Cuba.

If our present methods of tobacco culture are not practical or modern, we must change them. Surely the small amount of money required to pay the few experts needed could be secured, and the expenditure would be more than justified by the results that should be obtained in a very short time.

The idea that it takes a lifetime to learn the principles of tobacco culture is a fallacy, for it is no more difficult to grow tobacco than it is to grow many others crops. There are a number of Americans in the Cagayan Valley who have a fair knowledge of tobacco, and what is more they know the people and their methods. All will lend their influence toward improving the present situation.

To wait and dally is dangerous, and to put out a cheap and worthless product when, if we only put forth the proper effort, we can have as fine as there is in the world, is disastrous if not ruinous to our future trade. Let us begin now the effort to put our tobacco here on a par with that from Connecticut, Cuba, or Sumatra. There is no reason why we can not do this if we proceed with diligence, industry, and care. This is the time, and the opportunity is ours.

THE CENTRAL LUZON AGRICULTURAL SCHOOL.[1]

In the central part of the Province of Nueva Ecija, Luzon, lies the beautiful San Jose Valley. It is a vast rolling plain, covered here and there with forests of fine timber.

Through the efforts of Mr. T. W. Thomson, formerly division superintendent for Nueva Ecija, and Hon. Isauro Gabaldon, formerly provincial governor, a tract containing about 657 hectares (more than 2 square miles) was reserved for the use of the public schools of the Province of Nueva Ecija, and withdrawn from sale or settlement by Executive Order No. 10, dated April 12, 1907.

The site chosen was in the barrio of Muños, a part of the municipality of San Juan de Guimba. Of this 657 hectares about 400 hectares is fine prairie land, perfectly suited for all kinds of tropical agriculture. Here and there the prairie is dotted with small tracts of timber land, containing timber of all groups, sufficient for the needs of the school.

This reservation was made with a view to the establishment of a school modeled upon the plan of the Tuskegee Institute in Alabama. In requesting its reservation for school purposes, Mr. Thomson describes the land as follows:

> Among the advantages belonging to this tract is the fact that a good irrigating canal already traverses it, which will supply sufficient water for about half the land. The rest is so situated that another ditch will enable all of it to be irrigated. There is on the land sufficient timber for all necessary buildings for at least ten years, and yet there is plenty of open prairie for cultivation. The site is sufficiently elevated so that the extreme heat of the lower lands is modified. It is in the most healthful part of the province, being, as stated, without the extreme heat or the strong daily winds incident to San Jose, Bongabon, and other towns located at the foot of the mountain range. The tract is as beautiful as human eyes ever looked upon, being rich black loam, gently rolling, crossed by numerous small streams, with bodies of timber which are separated by larger or smaller park-like prairies.

In July, 1907, Mr. George Whiting and Dr. Edwin B. Copeland, now dean of the Philippine College of Agriculture, visited the site at the request of the Director of Education, and rendered a

[1] Report furnished by the Bureau of Education.

highly favorable report upon it, Doctor Copeland stating that it was a most beautiful site and the only place that he had seen that made him think of the Sacramento Valley, the garden spot of the world. But little more was accomplish until July, 1908, when upon the initiative of Manuel Tinio, governor of Nueva Ecija, now Director of Labor, the establishment of the school was given further consideration. At this time the Director of Education agreed to take steps toward the opening of the school, upon the condition that the province should construct such temporary buildings as might be immediately necessary, and build a road from Cabanatuan to the school site.

Shortly after Mr. Whiting was named superintendent of the school, though for a period of five months (from February to July) while Mr. Whiting was on leave in the United States, Mr. Sam B. Durham was in charge.

In September, 1908, a meeting with the provincial board of Nueva Ecija was held, at which time they appropriated a large amount of money to construct the road from Cabanatuan through to Muños, also ₱1,200 for temporary buildings. Work on the buildings commenced in January, 1909, and in March four buildings, a dwelling house of hardwood for the superintendent, a dormitory for the boys, a schoolhouse, and a shed for machinery, had been completed. Besides these buildings there is now a house for the Filipino teacher and a shed for cattle. All of these buildings except the superintendent's house are temporary structures.

The school was opened on July 19, 1909, with an attendance of twelve pupils. This number increased to twenty-six by the end of the month, and the school year closed with an enrollment of sixty-two for March, 1910.

In April, 1910, Mr. Whiting, on account of ill health, was relieved as superintendent of the school and replaced by Mr. A. A. Helms. Mr. Helms has been with the Bureau of Education since 1904, and for the past two years has been supervising teacher of Cuyapo, Nueva Ecija.

The Central Luzon Agricultural School is a regular intermediate school, in which the subjects of the farming course, as outlined by the Director of Education, are taught in grades V, VI, and VII. The school opened in June, 1910, with an enrollment of eighty pupils. Students attending the school are furnished with board, quarters, cots, mosquito nets, and blankets. A good Filipino cook has been secured to look after the mess of the students. In return for board and quarters the students are expected to perform daily four hours of work on the farm.

The school is well equipped for the work that is expected of it. It is provided with a sawmill, having a capacity of 6,000 board feet per day, a traction engine, a good blacksmithing outfit, and a complete assortment of general farming tools and implements, furnished by the Bureau of Agriculture, including a gang plow, a disk plow, small moldboard plows, harrows, and numerous smaller tools. Fifteen work animals, fourteen bullocks and six carabaos, have been furnished.

The faculty at present consists of Mr. A. A. Helms, superintendent; Mrs. Amy G. Helms, who has general charge of the mess and assists in the academic work; Mr. Guy Fridley and Mr. Cenon Monasterial, academic teachers; Mr. John Heggarty, engineer and machinist; and Desiderio Goco, blacksmith.

THE WORK OF NATIVE TRAVELING INSTRUCTORS IN THE GOLD COAST COLONY.

By W. S. D. TUDHOPE,
Director of Agriculture.

1. Native traveling instructors shall, for the most part, travel and instruct chiefs and native farmers in the best methods of growing and cultivating economic products and preparing them for the European markets; but they may be employed in such other capacity as the Director of Agriculture may from time to time consider necessary.

2. The points to receive most attention during the periods they are employed on instruction are briefly summarized as follows:

COCOA.

(*a*) The native farmer must be impressed with the importance of raising his plants from selected pods, and, where possible, selected trees, and not from the inferior fruits of his plantation.

(*b*) Wider planting than is adopted in the majority of cases should be enforced, and 12 to 15 feet apart is the distance that should be recommended. To produce the most and the best fruits, good trees with sound stems are essential, and if the trees are planted too closely together this end can not be attained.

(*c*) The native farmer should be taught to pay more attention to weeding and cultivating his plantation, both in the early stage and when the trees are full grown, as this will result in a more healthy and vigorous growth of the cocoa trees.

(*d*) He should also be taught to observe the signs of disease or insect attacks in their earliest stages and instructed to report their presence to the nearest government official, who, in turn, will take steps to inform the Agricultural Department.

(*e*) Instructions should be given in the means of treating such attacks, either by the application of insecticides or fungicides by spraying, etc., or, as in the case of borers, by removing the insects and destroying them; and by the excising and burning of all dead branches. In order to prevent rot or decay,

tar, or some such resinous product should be applied to the part of the growing tree from which excisions have been made.

(*f*) The best methods of pruning cocoa trees should be taught. In this connection it is better not to recommend too drastic pruning, and, in most cases, the removal of sucker growths will be sufficient. The importance of cutting off the pods and making all necessary prunings with a clean cut should be shown and the farmer instructed upon no account to break or tear off the branches or fruits.

(*g*) Pods should be gathered as they ripen and not allowed to remain on the trees after they are ripe, or the seeds will germinate on the tree and the pods will be spoiled. All diseased pods should be removed from the trees at each gathering of the ripe pods and collected and buried. Empty pods should on no account be spread about the plantation, but should be buried at once, as they form a ready breeding ground for injurious insects and fungoid diseases.

(*h*) Instructions should be given in the best method of fermentation; the form of boxes, etc., to be used and the general treatment of the bean. Insistence should be made on the effectual drying of the beans and on the importance of taking them immediately they are dried to market, unless suitable local storage accomodation is available. The beans may suffer much damage from bad storage and their value be considerably reduced.

RUBBER.

3. Instructions should be given in the growing of rubber plants; the methods of propagating and planting trees; in tapping and preparing the rubber from the latex, etc. The following are the chief points that need attention:

(*a*) The natives should be encouraged to plant rubber seedlings wherever they have suitable available areas of land. The variety to be recommended will depend on the locality of the plantation. If under jungle conditions (the shade of forest trees, etc., probably Funtumia would be the most suitable; but if circumstances are favorable, Para (*Hevea brasiliensis*) should be recommended. Where the area is bordering on the dry or savannah country, Ceara (*Manihot glaziovii*) and Memleku (*Ficus vogelii*) would be more suitable.

(*b*) Belts of rubber trees should, when possible, be planted round cocoa plantations, as they will eventually form a protection to the cocoa trees.

(*c*) The importance of not damaging the cambium of the trees in tapping must be taught.

(*d*) The method of preparing the rubber from the latex to be recommended will depend somewhat on local conditions; but probably the "boiling and double-pot method" as being easily adopted, should be that most generally advised, and the rubber, preferably, should be prepared in sheets or biscuits. If pure clean rubber could be produced, prices would be proportionately higher; and it should be pointed out that there is a danger of the "stinking sticky mixture" hitherto produced in the colony becoming unsalable in a few years time. Unless the present methods are altered and a better article produced, the industry must inevitably suffer.

PALM-OIL PRODUCTS.

4. Native traveling instructors must also encourage the development of the oil-palm products:

(*a*) By endeavoring to prevent the destruction of palms during the formation of cocoa plantations.

(*b*) By advocating systematic cultivation even to the extent of the formation of plantations of the higher oil-yielding varieties, such as Abobobe.

(*c*) By assisting the natives with information as to the best methods of preparation and the best machinery for extracting the kernels, etc.

COTTON AND FIBERS.

5. The cultivation of cotton and fiber-yielding crops, should be advocated. Districts where the soil is good and where there is a long dry season are suitable for cotton.

Sisal, hemp, Triumfetta and Hibiscus fibers might be profitably grown, and where recommended the method of extracting the fibers should be demonstrated.

Endeavors should be made, where possible, to extend the production of indigenous fibers, such as Piassava.

NEW ECONOMIC PRODUCTS.

6. Instructors must constantly be on the watch for new economic products, all information relating to which should be communicated to the Director of Agriculture with samples and, if possible, botanic specimens.

CATCH CROPS.

7. In certain instances they should recommend the cultivation of catch crops, which should, for the most part, be of the leguminous order, such as ground-nuts, tiger-nuts, cowpea, pigeon-pea, and native beans. In some cases cotton might also be recommended as a catch crop.

DEMONSTRATION.

8. In addition to giving these general instructions with regard to the agricultural products, it is the duty of native traveling instructors to demonstrate the methods which they teach, and their visits must not be of such a hurried nature as to preclude the performance of this important branch of their duties. Implements will be carried for this purpose.

GENERAL.

9. A diary will be kept in detail, a copy of which must be submitted to the Director of Agriculture at the end of each month, and, when necessary, they will also submit, in addition, a brief report on each tour.

10. One of the agricultural stations will be the recognized headquarters of each native traveling inspector and his tours will be arranged within the province in which his headquarters are situated.

11. Instructional tours will be arranged by the Director of Agriculture, in consultation with the provincial commissioners, and in Ashanti with the chief commissioner.

12. Native traveling instructors should, whenever possible, report by telegram their movements to the Director of Agriculture.

13. When native traveling instructors are not engaged in traveling they will be attached to the various agricultural stations, where they will assist the curators in whatever work their services may be required. They should take full advantage of such opportunities to note the various plants that are propagated in the nurseries and the supply of the same, and it should be their endeavor to get all economic plants (being propagated for the purpose) taken up by the native farmers within the year. Their usefulness will be largely determined by their success in this particular.

DEMONSTRATION FARMS IN MINNESOTA.[1]

Arrangements have been closed by which for the first time the expert instruction of the Minnesota State Agricultural College will be carried this season direct to the farmers on the farms, through the establishment, under the supervision of the Minnesota Federation of Commercial Clubs, of twelve demonstration farms, serving twelve general districts. Plans are being completed for the establishment of six additional farms, making a total of twenty, on which during the entire coming season the farmers will be instructed in the latest and most modern methods of cropping the tracts set aside.

Each of the demonstration farms will be 80 acres in extent, and the entire farming operations of the year will be handled by experts who will, in addition to demonstrating proper methods of plowing, cultivating, caring for the crop, and harvesting, introduce a complete system of farm accounts by means of which the balance sheet for each farm will show in the fall to a cent what profits have been made. The crops to be put in on the various farms will be such as will best serve the needs of the localities where the farms are located. Where corn culture is neglected or insufficiently understood, corn will be planted. Where grain farming is not up to standard the tracts will be planted to grain. The general rule of giving the farmers instruction along the lines where they are weakest will be followed, and the demonstration farms will be used in a general campaign to raise the standards of farm methods and production.

Each farm will be under the supervision of a Minnesota commercial club, which contracts in advance to provide necessary land for the work, to provide farm labor and equipment, and to gather together, each time the expert visits the tract, all the farmers of that region that they may observe the manner in which the work is done, question the expert and gain from what they see of the actual work, a clear idea of proper methods to be employed and the reasons. Following each visit of an expert, farmers' meetings will be held by the club at which the farmers

[1] From The Cablenews-American, February 23, 1910.

will quiz the expert and engage in the general discussion of current farm problems.

The movement for the spread of agricultural education to the farms was taken up by the Federation of Commercial Clubs after an investigation which showed that but a small percentage of adult farmers in Minnesota are able even to attend the winter short course of the Agricultural College. Through the active coöperation of Prof. Andrew Boss, of the Agricultural College, who will superintend the work of the coming season, the way was opened to select tracts of land which will serve during the crop season as schools for farmers who can not leave their farms. Professor Boss will carry on the active work with the coöperation of local clubs and business men and the results of the work will be gathered and bulletined from time to time for the benefit of thousands of men who can not be reached by the work on the demonstration tracts.

Eighty-acre demonstration farms are selected as a unit because of the fact that charging to operation the labor, equipment, and cost, it is impracticable to use a smaller tract and show representative farm profits from the work done. Farms have been established by the action of the federation at Breckenridge, Renville, Pipestone, Osakis, Delano, Bemidji, Wadena, East Grand Forks, Detroit, Rothsay, Willmar, and Stewartville and arrangements are being made to locate additional farms at Fergus Falls, St. Cloud, Alexandria, Watertown, Red Wing, Hibbing, and Brook Park. These points cover every condition met with in Minnesota as well as the various varieties of Minnesota soil. Hibbing is to have a farm where ten years ago it was thought practically impossible to successfully conduct agricultural operations.

THE DUTY OF THE AGRICULTURAL COLLEGE.[1]

By H. J. WATERS,

President of the Kansas State Agricultural College.

The American ambassador to Great Britain recently facetiously referred to our educational system as America's chief industry. In other ways it is frequently suggested that in this matter the rate of growth has been out of proportion to our development in other directions and beyond our real needs.

Of the 18,000,000 children in the graded schools in the United States to-day, less than a million, or less than one in twenty, will ever matriculate in a high school or an academy. Moreover, of the 900,000 pupils in the secondary schools, only about 200,000 will be enrolled in our colleges and universities, or approximately one out of every four.

It requires, therefore, approximately 80 pupils in the grades to supply one college or university student. Less than one in five of these college and university matriculates graduate. Therefore, over 400 graded school pupils are required to furnish one college graduate.

Of more significance than all this is the fact that seven out of every eight of the boys and girls of the United States leave school between the fifth and sixth grades and go out into a world of splendid opportunities without the training and intellectual power to enable them to take advantage of these opportunities.

It would not seem, in the light of these facts, that there was much serious competition in education. In fact, it does not appear that we are doing very much to break down human ignorance and overcome human prejudice.

TAKE THE COLLEGE TO THE PEOPLE.

While it is of paramount importance that the college give thoroughly sound instruction to the young men and young women in residence, it is equally true that its activity must not end

[1] Extracts from the inaugural address of Prof. H. J. Waters, on the occasion of his formal installation as president of the Kansas State Agricultural College, Manhattan, Kansas, November 11, 1909.

here. More and more must the college be carried to the people. At best but a small proportion of those who should avail themselves of its advantages can leave home.

Farmers' institute.—This phase of the college work, as it affects the farmer, is already well organized and bringing splendid results. Through the farmers' institutes, farmers' conventions, instruction trains, demonstration farms, etc., the whole State is being reached. It is expected that the representatives of the college will this year come into personal touch with fully 75,000 farmers and farmers' wives, or more than one out of every three farmers in Kansas. It is possible that it will soon be found necessary to offer courses in agriculture and home economics of varying lengths in different parts of the State to accommodate the increasing demand for instruction in these subjects on the part of those who can not leave home.

Outlying experiments.—It is not sufficient to conduct experiments at Manhattan and Fort Hays and call the problems finally settled, in accordance with the teachings of these results. Kansas is a large State, with a great variety of soils, and great variation in rainfall and in plant and animal adaptation. As soon as funds for this purpose can be provided and the work so organized that it may proceed in each case along lines that are fairly certain to yield profitable results, there should be instituted systematic tests or experiments in every county in the State. This will be found profitable not only because of the exact information secured, but by reason of the greater confidence which the farmers will have in the results, because they were secured under conditions which they recognize as identical with their own.

Then, these experimental fields may also serve an exceedingly valuable educational purpose, by being so planned that they demonstrate some point in agricultural practice of especial importance to the community in which they are established.

Farm practice is developing at so rapid a rate and so many methods are being found to succeed well under one set of conditions and not under another, that for the individual farmer to try, at his own expense, all that good judgment indicated might be worth trying, would mean that his farm must become an experiment station instead of a business enterprise. It is therefore the business of the State and Federal Government to put these things to the test for him, and under conditions closely approximating his own.

State surveys.—For the first time in our history, we have become interested in the conservation of our resources. A young

nation, like a young person, is proverbially profligate of its resources. Ours has been a waste of the resources of soil and forest and stream that is without parallel in the history of the world. This waste has been largely due to improper systems of farming, and can not continue another century without bringing ruin to America's basic industry. Under the teachings of institutions like this, larger returns may be secured without depleting the soil than are now secured under a system of land spoliation. This is a matter of concern not only to the landowner, but to the whole of society, since the future welfare of our cities and factories and churches and schools is directly dependent upon the returns from the farm.

We are not in a frame of mind to consider methods of checking this waste. The first step is to take account of stock. The Kansas landowner needs to know what types of soil he has, what amount of plant food each contains, to what each is best adapted, and how it may be managed to yield the largest return without having its productiveness diminished. The college should at once organize a State soil survey, and push it toward completion as rapidly as the facilities provided by the State and Federal Government will permit. This is fundamental to all agricultural progress. Later, surveys of special industries or crops should be instituted, to determine upon what types of soil and under what conditions they are succeeding and under what conditions they fail, that it may form the basis of researches to point out the way to make them successful under all conditions.

A corn and forage plant survey, to extend the boundary of successful farming still further westward, is an enterprise in which this State can well afford to engage.

Conserving water power.—These efforts should not be limited to agriculture. A series of investigations and experiments looking toward the conservation and utilization of the water supply of the State, for the purposes of both irrigation and power, is a duty which the college owes to the public. There are doubtless many localities in which sufficient power could in this way be developed to supply the needs of farm and village within the radius of 20 or more miles. In many other places hydraulic power could be developed sufficient to furnish light and power for from one to a dozen farms.

The loss to crops from improperly distributed rainfall in this State is enormous. In many places water could be economically stored during the wet seasons, to be used for irrigation purposes

when the rains fail. In other localities, the underground supply of water might be profitably utilized by a proper method of pumping.

The protection of life and property against floods is a matter of serious importance, and commends itself to our favorable consideration. Water purification and sewage disposal are as yet unsolved problems for the greater proportion of the State.

Tests should be carried on to determine the draft and efficiency of farm implements with the expectation of establishing standard designs for the different conditions of soil.

Kansas produces gas, oil, and coal in large quantities. Much of this has been wasted in the past and is being wasted under present conditions. A series of tests conducted on a commercial scale will do much toward establishing standard methods for the preparation and use of these materials.

The gasoline engine will, for some time to come, be the principal prime mover for small units in this State. The cost of gasoline is constantly increasing. Under present conditions denatured alcohol can not be used economically. Investigations that will lead to methods of manufacture of denatured alcohol at a low price, and to methods of producing gas from Kansas coal successfully, will do much to extend the use of this type of engine and to cheapen the cost of power.

THE COUNTRY ROAD.

Of more importance than all of these is the country highway. We have, through long use, worn out the natural roads, and have not yet found a successful substitute. Through the recently created department of public highways of the college, however, it is expected that we shall be able to educate the people concerning the importance of this matter. Moreover, through this means the college is now pointing out the most satisfactory way of maintaining earth roads, imparting information in regard to the best systems of permanent culverts and bridges, and as rapidly as the people of a community will assume the cost, will supervise the construction of permanent roads.

At all times the people have been found ready to pay taxes for permanent public improvements, if they are confident that the money will be judiciously expended. It is through careful supervision by the experts of the college that the ordinary mistakes of the planning and construction of these highways and bridges will be avoided.

PRODUCTION AND DISSEMINATION OF IMPROVED PLANTS AND ANIMALS.

The colleges of agriculture must lead in plant and animal improvement. A plan of improvement instituted by an individual is seldom carried beyond his lifetime. In a college, if well managed, a program of improvement may be carried forward without interruption for many generations, indeed indefinitely. It will be highly profitable for the State to encourage the more general use of better farm crops and live stock, by disseminating these improved strains, through the college. Already a large impress has been made upon the agriculture of Kansas, in both plants and animals, and experiments are now in progress which it is confidently expected will yield even more important economic results.

THE EXPERIMENT STATION.

The primary function of the experiment station is to extend the domain of human knowledge. It has been the chief factor in creating agricultural knowledge. It was the experiment station which won back to the college the confidence of the farmer, which confidence had been forfeited for lack of ability to lead him.

It is the experiment station which has supplied the teacher with accurate and well-organized knowledge to impart in the class room. It has been the experiment station which has provided the way for these institutions to become real leaders in the realm of agriculture and has exerted an influence upon agricultural practice that is epoch making.

It is an admirable work to turn out young men trained for leadership on the farm and capable of going among farmers as teachers of correct systems of agriculture, or to lead young men who come to the college to a better knowledge of the subject; but, after all, the greatest work these colleges have to do is to equip men with the proper knowledge and the necessary inspiration to advance the world's knowledge and to supply these thousands of teachers with something to teach.

It is, therefore, a fundamental mistake to assume that the duty of the experiment station is solely or even principally to benefit the farmer directly. A larger responsibility rests upon it—that of making an exact science of agriculture, so that it may be successfully taught in the colleges, the high school, the graded school, the farmers' institutes, and on demonstration farms.

The value of research is not limited to the industries. It is the very life of a teaching institution such as this. It gives

point to the instruction. The teacher who is an investigator is a live teacher; no man can long keep alive as a teacher and not conduct researches.

RESEARCH TO ENCOURAGE MANUFACTURE.

But research in these institutions has been restricted to too narrow a field. Little attention has been given to problems other than production problems. The effort has all been in the direction of making two blades of grass grow where one grew before; or of increasing man's efficiency with this or that machine. The time has come when its influence should be materially extended. The wastes of a rural community are not all to be found in the processes incident to production. An equal waste occurs in the marketing and utilization of the materials produced.

The investigations should, therefore, include agricultural manufactures and the utilization of the wastes on the farm. Factories should be developed in the country, near the sources of production, for the preparation for final consumption of the materials grown on the farm. Such factories are necessary for the highest degree of economy in the production of food and to give the laboring man an opportunity to gain a livelihood outside of the congested city. Foodstuffs are already too high to stand the strain of the additional cost of transporting the raw materials long distances in order that they may be manufactured into edible form, then shipped back to the consumer in the very community in which they were grown, and where their manufacture might have been accomplished to better advantage. In countries where the raw materials of our foodstuffs are chiefly grown, there they should be chiefly manufactured. Kansas wheat should be milled in Kansas. Just as the experiment station has made a profound impress upon the methods of farming, so may it improve the methods of manufacturing the products of the farm. The millers of the State need just such scientific assistance as the station can provide, all with a view not so much to helping the miller directly as to improving the quantity and quality of the foodstuffs garnered from the Kansas wheat fields.

THE ECONOMICS OF MARKETING.

Such vital questions as how to dispose of the products that they may yield the largest returns, or how to spend the income so as to bring the best results in the highest sense, have been practically neglected.

To correct this one-sided development and meet this larger

demand, the department of history of the college should be so strengthened and enlarged as to cover, both by instruction and by research, the industries of our country. The department of economics should be prepared to fully cover the range of transportation, manufactures, marketing, etc., as they relate to the farming and industrial classes. The department of sociology should deal with the life of the people in the open country and in the districts supported by the industries, and be able to suggest plans for their immediate and permanent improvement.

The department of architecture should make a large impress upon the homes and public buildings of the State, and upon the location and arrangement of the accessory buildings that they may conserve the strength of the housewife, afford the sanitary conditions essential to health and add to the comfort and pleasure of country life.

AMERICANS LIVE WASTEFULLY.

Americans, poor and rich, live wastefully. This can not continue. A new basis must be established which shall, while avoiding the extreme care and economy of Continental Europe, which destroys initiative and kills pride, stop the major wastes in our system of living.

But of more importance than mere economy of living is the influence of the environment and method of living upon the race. Will out of it all in the long run come a strong and virile race of people, a race capable of meeting the complex problems of the future and advancing still further our civilization?

It is especially appropriate to emphasize this point in the institution which, among the land-grant colleges at least, has been a leader in this line, and which to-day boasts the largest and perhaps best equipped department of domestic science and art in America.

As much, however, as has been done in this direction here and elsewhere, and proud as we have a right to be of the record of this college in this direction, real work has been hardly begun and we scarcely realize what this great movement means and what will be its future development. Certain are we, however, that it means something more than the mere teaching of young women how to sew and how to cook. It has involved in it the whole question of home building and the rearing of a strong and virile race of people. The dream of the ancients, a strong mind in a sound body, is thus beginning to be realized. But we have only just come to take this view of the matter and have scarcely begun work on this broad basis. Times are strangely

out of joint when we justify the extensive scientific inquiries into the way to rear a strong and vigorous race of pigs or sheep or colts or cattle, and are content with the very meager knowledge which we possess of the nutrition of men. We have millions for research in the realm of domestic animals, and nothing for the application of science to the rearing of children. Exhaustive studies are made upon the life histories of animals of the lower orders, while vital facts in regard to the life history of our children remain a sealed book. We know how the amœba develops, but are content to remain in ignorance of what factors contribute to the development of a strong body and a sound mind in mankind. For centuries we have let the injunction "Know thyself" go unheeded, and have forgotten that "The greatest study of mankind is man."

For every dollar that goes into the fitting of a show herd of cattle or hogs or into experiments in feeding domestic animals, there should be a like sum available for fundamental research in feeding men for the greatest efficiency. The Kansas State Agricultural College ought to take advanced ground here, and build up the greatest institute of research in human nutrition in the world. The Federal Government should be interested and coöperate with the State and community in matters of this sort.

THE EXODUS FROM THE FARM.

It is common to lament the tendency of the best men and women to leave the farm and go to the city as a modern or present-day tendency, whereas it is as old as civilization itself.

Plutarch in his "Praecepta Politica" protested against the threatening invasion of large cities; Cicero thundered against the depopulation of the rural districts through similar attractions to those which draw young men and young women from the farm to-day. Even Justinian, the great lawmaker, was in favor of legislation designed to keep the people on the farm.

The great Roman Emperor Augustus before the Christian era saw that his empire was being undermined and the strength of his people sapped by the exodus from the country to the city, and called to him the poets of the nation and commanded them to sing of the beauties and profits of country life, in order to attract his people back to the land. This trend cityward has been to a great degree due to the half education which has prevailed in the rural districts and which has given the farm boy glimpses of the more attractive city life without teaching him at the same time how he may attain such a life at home.

For the first time in history this situation is sought to be met

by making a profession of farming, so that it may be attractive to the intellectually strong, at the same time that the returns are large enough to command the reasonable comforts and luxuries of life. These countervailing influences, however, will be found to be inadequate unless they strike at the very root of the difficulty—the farm home, the country road, the rural school, and the country church.

VOCATIONAL SUBJECTS IN THE PUBLIC SCHOOLS.

This means that vocational subjects must be introduced into the courses of study in the grades and in the high schools, as well as in the colleges and in the universities. So rapidly and so fully has instruction in vocational branches been developed, that the best and cheapest places to learn farming or stock raising or dairying is now, not on the farm, but in a college. The horse doctor has been displaced by the college-trained veterinarian. The place to learn to sew and to cook and to build and manage a home is, not in the home, but in a college. The period of apprenticeship of the machinist has been supplanted by a course at college, and the employers of engineers no longer look elsewhere than to the colleges for this training. But gratifying as all this is to us, we must realize that at best the problem of bringing industrial education within the reach of the masses, and this is the great problem, is very far from being solved. In the nature of the case, but a small proportion of the people can attend college. It has already been pointed out that less than a dozen of every thousand pupils in the graded schools go to college. When we consider that these twelve are divided among the various courses offered by our colleges and universities, such as academic theology, law, medicine, teaching, journalism, agriculture, engineering, etc., we realize how small a proportion of the boys and girls of the country really come under the influence of this sort of instruction when it is confined to the college. To reach the masses with this work, it will be necessary to introduce it into the high schools and grades the country over. In the city schools, home economics and manual training, with agriculture optional, and in the country schools, home economics and agriculture, with manual training optional.

To the objection that these subjects, especially home economics and agriculture, of a character suited to the grades and high schools, are not yet teachable, I urge that they are far more teachable than were these same subjects of college grade twenty years ago, and that if we will apply ourselves to the problem

of reducing them to pedagogical form with the same zeal and determination that characterized the efforts of the college teacher, equally satisfactory results will be forthcoming.

To the objection that the teachers are not prepared, I answer that the demand for teachers so prepared is all that is necessary to fully meet this difficulty.

AGRICULTURE IN THE RURAL SCHOOLS.

This is the next great educational problem. In fact the rural school to-day, considered broadly, presents the most serious educational problem with which we have to deal. How to shape the instruction in this unorganized, isolated, and poorly equipped school so that the pupils may not lose sight of the farm, its life, its problems, its beauties, and its profits, is the great question now before us. The hope of these schools and of our system of public education lies, not in the abandonment of these country schools, not in the attempt to substitute something else for them, but rather in making them serve their constituency in the best way and contribute most to the development of the boy or girl who is fortunate enough to have been born in the country.

The problem does not consist in the long run wholly or even mainly in finding a suitable teacher, although this is perhaps for the moment the limiting factor in progress.

As Professor Bailey has well said:

"If a room or a wing were added to every rural school house, to which children could take their collections and in which they could do work with their hands, it would start a revolution in the ideals of country school teaching, even with our present school-teachers."

In short, our rural school system needs to be so revised that from the very outset the courses, to quote the words of a distinguished English educator, "shall be woven around knowledge of the common phenomena of the world * * *. For it should be the purpose of these elementary schools to assist boys and girls according to their different needs to fit themselves practically as well as intellectually to the work of life."

I do not wish to be understood, in quoting the foregoing approvingly, to advocate the making of the graded or high schools narrow or provincial. Nor would I permit these schools to become in any sense professional—except possibly the last two years of the course in a first-class high school. This might appropriately be made as severely professional as the funds for providing the additional teachers and equipment would permit.

INDUSTRIAL SUBJECTS WILL VITALIZE.

The benefits to accrue from the successful introduction of agriculture, home economics, and manual training into the schools will not be confined to the direct influence which this instruction may have upon the industries involved, but this will be found to be the best way to vitalize elementary schools, and especially those in rural communities. Just as these useful subjects gave new life to our college courses, so will they be found capable of vitalizing the elementary courses.

TRAINING THE TEACHER.

As before intimated, the lack of suitably trained teachers for this work is temporarily the limiting factor in our progress. Where the teacher shall receive his training, and of more fundamental importance, of what it shall consist, are questions not yet answered. Thus far no very satisfactory place for securing this training has been provided. A number of agricultural colleges of the country are offering courses in agriculture, etc., especially for teachers, and these in the main have been successful.

Congress recently recognized this lack in our educational system, and provided, in the Nelson amendment to the Morrill Act, that a portion of the increased support thereby given the colleges of agriculture might be used for "providing courses for the special preparation of instructors for teaching the elements of agriculture and mechanic arts."

Whether experience will in the end show that the normal school, with agriculture, home economics, and mechanic arts added, or the agricultural colleges, with sound courses in education added, will best meet this situation, or whether it may not indeed become expedient to employ both methods, I will not at this time hazard a guess. We are all, I take it, more interested in having this work done and done well, than in the question of where or by whom it shall be done. Certainly there are many people now teaching who desire to equip themselves to teach agriculture. These naturally would be best served by courses at the agricultural college.

EXPERIMENTS IN TEACHING INDUSTRIAL SUBJECTS.

To my mind, there can be no question as to the propriety and profitableness of establishing at the agricultural college, where agriculture, home economics and mechanic arts reach their highest development, and where there is the greatest

interest and enthusiasm in these subjects, systematic investigation of the methods of teaching these subjects of a grade suitable to the requirements of high schools and rural schools. A sort of pedagogical experiment station for the systematic study of these and kindred problems is no less important than are agricultural experiment stations, to study questions relating to corn and wheat growing and the raising of live stock, and no less logical than engineering experiments to study questions in relation to bridges, highways, sanitation, etc.

FARMER OR PEASANT.

It is not primarily a matter of increased financial return, but has involved in it the future welfare of America's agriculture. Further advancement must be based upon the increased intelligence of the man who is to till the soil, together with his better understanding of the fundamental laws of nature with which he has to deal.

If the American farmer is to prove an exception to the history of the world and remain the independent, thinking, reading, progressive individual that he has thus far been instead of becoming a peasant, as the farmer has been before in all history, it is necessary that he be given the broadest possible training, and be educated most thoroughly in the fundamental principles underlying his profession.

THE INDUSTRIAL AND THE CULTURAL MUST GO TOGETHER.

It is said that an ancient and honorable university once wrote over its portals: "No useful knowledge taught here." I would not go to the opposite extreme and write over the portals of even this institution—the child of a strictly utilitarian age—the legend: "No subject that is not useful taught here." I would make all the courses practical enough to fit men for efficient service in their several professions and pursuits of life, and at the same time liberal enough to prepare them for the highest service as citizens.

The best part of an educational institution is its spirit—is the point of view which it gives its students—the ideals which they carry away from its halls and through life, for of more worth than fine gold is a quickened conscience and a capacity to distinguish between what is right and what is wrong.

"A high ideal is the noblest gift man can bestow upon man. Feed a man, and he will hunger again; clothe him, and he will become naked. Give him a noble ideal and that ideal will abide

with him through every waking hour, giving him a broader conception of his relation to his fellows. The ideal must be so far above us that it will keep us looking upward all our lives and so far in advance that we shall never overtake it."

Those whom we send out must make a large contribution to the welfare of the world.

GREAT TEACHERS MAKE A GREAT SCHOOL.

We point with a pardonable pride to our splendid group of buildings, the broad expanse of fertile soil which constitutes the college farm, the improved plants and animals, boasting of both a distinguished lineage and an honorable career, to the shops and equipment of laboratories and libraries, to the new athletic fields and gymnasium in immediate prospect, and to our other material possessions, and unconsciously make the sum of these, the college.

It is, however, the teacher who determines the worth of the school. We have no means of measuring the value of a great teacher. It was in the musty law office of John Wythe that Thomas Jefferson studied, as did also one of the greatest judges that ever sat upon the supreme bench, John Marshall, and also the greatest orator that ever electrified an audience in his period of the world's history, Patrick Henry. John Wythe was himself chancellor of Virginia, and a great man, but great chiefly for the men he made.

Given a good teacher, and locate him in a cellar, an attic, or a barn, and the strong students of the institution will beat a path to his door. Given a weak teacher, and surround him with the finest array of equipment that money can buy, and permit the students to choose, as in the elective courses, and his class room will echo its own emptiness.

A poor teacher in a German university, where all subjects are elective, is a matter of comparative indifference, but in an institution such as ours, where the courses of study are fixed, to keep a poor teacher year after year and require hundreds of young men and women to waste their time in his classes, is little short of a crime.

Economy in teachers' salaries is false economy, and will quickly react upon the institution and upon the state. Low salaries mean cheap teachers and low-grade work. The 2,500 or more students who come here annually to secure an education have a right to demand the best. To lose our best teachers the moment we have developed them to a high degree of efficiency, because

we can not meet the salary paid in kindred institutions is deplorable in the extreme. Or to secure good teachers and so load them with work that they can not render the most efficient service is an equally poor policy.

It should be the business of those intrusted with the administration of a college to secure the best men available, supply them with such facilities as will make them content, and then have the wisdom to let them alone.

PHILIPPINE MAGUEY.

By M. M. Saleeby,
Fiber Expert.

The maguey plant of the Philippine Islands, *Agave cantula;* the sisal plant of the Bahamas and Hawaii, *Agave rigida sisalana;* and the sisal plant of Yucatan (usually known as *henequin*), *Agave rigida elongata,* closely resemble each other, both in general appearance and in habits of growth. During the past few years several million sisal plants have been imported into the Philippine Islands from Hawaii, but up to the present time practically all of the so-called "maguey fiber" produced in the Philippine Islands has been obtained from the species that has long been grown here, *Agave cantula.*

DESCRIPTION.

Both the maguey and sisal plants have a comparatively short and thick stem, and aloe-like cluster of large, fleshy leaves, and a tall flower stalk on which grow a large number of small bulbils or "pole plants." The leaves are grouped compactly around the stem and terminate in a hard, sharp spine. The maguey plant has numerous sharp spines along the edges of the leaf, but in the Hawaiian sisal these spines are largely, or entirely absent. The life of these plants ranges from seven to twenty-five years, depending upon the variety, soil, and climatic conditions, and the treatment and cultivation they receive. They do not flower until they are at least seven or eight years old, hence the belief that they flower only once every century and the popular name, "century plant."

DISTRIBUTION.

The maguey plant is not indigenous to the Philippine Islands. It was probably introduced from Mexico, but we have no record as to when or by whom it was introduced. It has been grown in various parts of the Islands for more than a century, but until comparatively recent years for practically no use other

than serving as fences or hedges, for which it is admirably adapted on account of the numerous spines on its leaves. It is only within the past few years that any considerable interest has been taken in its cultivation. The provinces where maguey fiber was first produced as an article of commerce are Ilocos Sur and Ilocos Norte. Of late the interest in its cultivation has spread into many other provinces where suitable climatic and soil conditions exist, and its cultivation in some of these provinces has already passed beyond the experimental stage. There is probably no other economic plant which is so well adapted to the conditions existing on the greater part of the Islands of Cebu, Siquijor, and Mactan as maguey. There are thousands of hectares of land suited to maguey cultivation on these and other islands, which, if properly cultivated, would give a better return for the money invested than any other crop that could be raised on them. This is also the case on quite a considerable area in other provinces which, owing to their location and other conditions, are not suitable for abacá, rice, coconuts, or any other of our staple crops.

The following are the principal provinces where maguey is cultivated and the fiber produced as an article of commerce: Ilocos Norte, Ilocos Sur, Cebu, La Union, Pangasinan, Zambales, Batangas, and Bohol. In other provinces the maguey plantations are as yet young and are not producing fiber in commercial quantity.

CLIMATE.

The maguey plant does not require an abundant and continuous supply of moisture like abacá and most other tropical plants. A long dry season and a light rainy one are essential for the best growth of this plant; while warm, clear, dry weather, with bright sunshine is required to dry and bleach the fiber. The thick and pulpy leaves of the maguey render it capable of withstanding long droughts which would be disastrous to most other economic plants. Sudden changes of heat and cold, however, as well as strong winds are undesirable, and with an excess of rain the plant tends to produce leaves having a large amount of pulp and a small percentage of fiber.

SOIL.

The most essential step in maguey cultivation is the selection of a well-drained soil. All low soils where the water table is within a depth of 60 centimeters or less from the surface, and all swampy soils, should be avoided. The maguey plant never flourishes in wet soils, as its roots are very sensitive to moisture

and in such a soil the plant will either die outright, or linger on in an unhealthy condition.

Shallow, rocky, limestone soils and soils formed by the disintegration of coral rock are best suited for maguey growing. The plant is very hardy and its roots can penetrate deep into hard stony soils. This should not be taken to mean that it can survive in rocky land devoid of soil; a certain amount of soil and a certain degree of fertility are both necessary for its development. Very rich soils, such as are required for abacá, are not suitable for maguey, for the reason that on such soil it develops thick, pulpy leaves with less and weaker fiber. Sandy soils, such as are often found along the sea beach at a distance from the reach of salt water, often give fairly good results with maguey.

PROPAGATION.

Maguey is usually propagated by using either the suckers that spring up from the roots of the old plants, or the pole plants that are produced on the flower stalk. The suckers appear about the second or third year from planting. They grow around the mother plant, and continue coming up for a number of years. Pole plants are produced on the lateral arms of the flower stalk, which makes its appearance at the time the plant comes to maturity. When the flowers have fallen, the flower stalk does not immediately die; but at the ends of the branches, on the axil of the flower-scars are produced these numerous small bulbils which eventually develop into small plants and fall to the ground, where they may be gathered and set out in a nursery before planting in the field. The use of the root suckers is, ordinarily, the most satisfactory method of propagation, and plants obtained by this method are usually stronger and of a more rapid growth than those produced from pole plants. Where suckers are used, no operations are necessary further than digging them up and piling them in heaps until they are dry, prior to planting in the field. Drying the suckers before setting them in the field gives the plant a healthier and stronger growth than where they are set out fresh and green, and the drying is necessary if they are to be shipped long distances.

PLANTING AND CULTIVATION.

Where the land is arid and rocky, the suckers or nursery plants may be set out without any preliminary preparation of the soil; but where there is underbrush or weeds, it is necessary to clear the field and burn the waste. This preliminary clearing helps a

great deal in subsequent cultivation. Where it is practicable to do so, the land should be plowed and a secondary crop planted at the same time the maguey is set out. Where the land is thus prepared, the maguey makes a more healthy and rapid growth and the secondary crop affords an income to the planter until the maguey can be harvested. If the soil is too rocky to allow of thorough cultivation, it may be possible in some cases to plant some legume, such as peas or beans, which by supplying nitrogen add fertility to the soil.

The maguey plants should be set out in straight lines about 2.5 to 3 meters each way, depending on the nature of the soil, and upon whether the location is exposed to, or protected from, strong winds. If the plants are set out closer than this, the leaves when full grown will cross each other and, during strong winds, cut each other with their terminal spines, causing considerable damage to the fiber. The common method in the Philippine Islands of planting maguey 50 centimeters to 1 meter apart has nothing to recommend it. The advantages of wide planting are many, among which may be mentioned four: First, to allow the free circulation of air and light which greatly stimulates the growth of the plant and tends to prevent the spread of fungus diseases which sometimes attack its leaves; second, to allow proper cultivation, weeding, and harvesting; third, to allow interplanting of secondary crops that will considerably reduce the cost of the upkeep of the plantation; and, fourth, to give the roots a larger area from which to obtain a supply of plant food, thus enabling the plants to thrive better and live longer.

It is often stated that maguey will grow and thrive under conditions of neglect that would be fatal to other plants. This is true to a certain extent, but it is also true that the plant responds very freely to a rational treatment on the lines mentioned above.

An occasional digging up of the root suckers will add considerably to the welfare, and will prolong the life, of the maguey plant.

HARVESTING.

The first crop of mature leaves will not be ready for cutting before the end of the third year. With the periodic and proper cutting of the leaves, the plant continues to grow and produce new leaves; failure to cut the leaves when mature tends to retard the growth of the plant and also shortens its length of life. From 25 to 35, sometimes 40, leaves can be harvested annually from one

plant. The cutting should commence at the beginning of the dry season; and in case there are two dry seasons in the year, two harvests can be gathered, provided that not more than 15 to 20 leaves are cut at one time. The leaves should be cut with a sharp knife and at a distance of not less than 2 to 3 centimeters from the stem, care being taken not to split or break the leaf during the operation. After cutting, the lateral and terminal spines should be trimmed off to facilitate the handling and transportation of the leaves to the place of cleaning. With the Hawaiian variety this operation is not necessary.

There are two ways by which the planter can tell whether or not the leaves are mature. First, as soon as the leaves ripen they turn darker in color; and, second, they incline toward a horizontal position. It is usually safe to cut the leaves when they form an angle of between 60° and 90° with the stem. Early cropping and overcropping both result in shortening the life of the plant, in producing an inferior and weaker fiber, and in leaving the young and tender leaves unsupported and exposed to the full strength of the wind.

EXTRACTION OF FIBER.

The fiber should be extracted from the leaves within twenty-four hours from the time of cutting. If left a longer period than this, the leaves are liable to dry, especially at their tops, and the fiber becomes discolored and weakened.

There are two methods used in the Philippine Islands for extracting maguey fiber. The first and most generally used is the "retting" method, by which the leaves are either crushed or cut longitudinally into strips and then tied in bundles and immersed in salt water. The bundles remain in the water from six to eight days and during this period they should be turned over a number of times so as to have a uniform decomposition. After decomposition is complete, the leaves are taken out of the water, and the decomposed tissue or pulp is beaten or scraped off. The second method is that of maceration without soaking in water. The leaves are crushed and left until fermentation has taken place, when the pulp can easily be separated from the fiber. By this method the leaves actually rot, and the fiber is both weakened and discolored.

The first method, which is ordinarily used in all parts of the Islands where the fiber is produced, is preferable to the latter, which was used in some localities in Mexico prior to the introduction of fiber-extracting machinery. Both methods, however,

require a great deal of time and labor, and result in the production of a weak and inferior fiber. They can only be recommended where it is impossible to procure a machine.

During recent years most of the fiber produced in Mexico, and other countries where fiber of the *Agaves* is a commercial product, has been cleaned by machinery. All of the machines used for this work are constructed on the same general principle. The leaves in passing through the machine are carried over a heavy brass "shoe" upon which revolves a scraping wheel. The knives on this wheel remove the pulp and leave the clean fiber. The larger machines have three scraping wheels and clean the leaf at one operation. The small machines have but one scraping wheel, and where these are used each leaf must be passed through the machine twice. The capacity of these machines varies from 10,000 to 200,000 leaves per day of ten hours.

Cleaning with a machine does away with the trouble and the slowness of the retting method. The sisal industry in Mexico remained dormant until machines were put on the market. The difficulty of securing enough laborers who were willing to clean the leaves by the old methods, as well as the slowness of these methods, kept the cultivation of the plant restricted to small and scattered areas, as is the case in most of the maguey districts in the Philippine Islands. Unless Philippine maguey planters establish larger plantations or adopt some scheme of coöperation, they can never hope to be in a position to advantageously use the larger and more desirable machines.

The yield of maguey from a given area depends upon soil conditions, the distance the plants are set apart, the amount of care and cultivation given them, and the time and method of harvesting. Often two adjoining fields differ considerably in their yield. Overcutting, though it gives a larger crop at first, always results in a decrease in yield of subsequent crops.

Experiments with maguey and sisal leaves show that the latter contain a higher percentage of fiber, the maguey fiber being whiter, finer, and lighter than the sisal. The percentage of fiber in a sisal leaf ranges from $4\frac{1}{2}$ to 6 per cent, while that of maguey does not exceed 4 or $4\frac{1}{2}$ per cent. Some sisal leaves have been known to give as high as $6\frac{1}{2}$ or 7 per cent of dry fiber, but such yield is unusual, and considerably above the average.

In experiments made in Naga, Cebu, the average weight of one leaf of Philippine maguey was found to be 700 grams and the average amount of fiber in each leaf 23 grams. On this basis every 1,000 leaves would average about 700 kilograms in

weight and contain about 23 kilograms of fiber; or 1 hectare of 1,500 plants producing 45,000 leaves should give an annual yield of 1,035 kilograms or about 16½ piculs of fiber.

THE FIBER AND ITS USES.

A cross section of the maguey leaf shows that the fiber lies crowded in the parenchyma or leaf tissue. Only the fibers in the middle of the leaf extend to the end of the leaf while the rest end at variable distances from the tip, the lateral fibers being the shortest. The fibers have a prominent central canal which is filled with air; it is polygonal in shape and of the same form as the section of the whole fiber; its walls are not of a uniform thickness. The fiber is large, inflexible, slightly yellowish, and of a great tenacity. This latter quality renders it very valuable in all cases where sudden strains are anticipated, while its lack of elasticity prevents it from being used to advantage in power transmission. The fiber terminates in points, sometimes lopped or forked. The data relative to its strength and resistance are contradictory owing, in all probability, to the irregularity in its thickness and the variable thickness of its walls. It can not withstand the destructive action of salt water, hence its inferiority to abacá for ships' cables.

The principal market for this fiber is in the United States, where it is largely used for the manufacture of binder twine. It is also used for tarred lath, fodder yarns, and various other cordage purposes.

In Yucatan, other parts of Mexico, and South America sisal is used locally for cordage, nets, hammocks, saddles, and upholstery. The Yucatan sisal hammocks are famous for their strength and durability.

In the Philippine Islands considerable maguey fiber is used locally. The young leaves are carefully selected and cleaned by the same process used in cleaning pineapple leaves. The fiber thus cleaned is very fine and silky, and is used for making cloth, fine handkerchiefs and other articles.

In some provinces, especially in Ilocos Norte, Ilocos Sur, Pangasinan, and Cebu, the fiber is used to some extent for the manufacture of cordage.

CONCLUSION.

In certain localities in the Philippine Islands there are large tracts of arid, rocky land, and a long dry season; under these conditions maguey is probably the most profitable crop that can be grown. Soil conditions in the greater part of the Is-

lands of Cebu, Siquijor, and Mactan are exceptionally favorable for the cultivation of maguey.

The three main points essential to the development of the maguey industry in the Philippine Islands are: First, the adoption of a satisfactory method of planting; second, the discontinuance of premature and overcropping of leaves; third, the introduction of fiber-cleaning machinery. Maguey fiber is a staple product and its use is likely to increase as its production increases. With the improvements above suggested there is no reason why this industry should not grow in the Philippine Islands as it has grown in Yucatan, Hawaii, and other countries.

THE FIBER MARKET.

The following data on the New York fiber market taken from Smith & Schipper's monthly report, dated New York, May 2, 1910, it is believed will be of interest to fiber growers in these Islands.

MANILA (ABACÁ).

The market has ruled firm during the month, and at the close all grades show an advance over the prices quoted in our last circular. The advantage has been more noticeable in "midway" and better which qualities are now $\frac{1}{4}$ to $\frac{1}{2}$ cent per pound higher than on April 1. The great scarcity of these grades, together with the demand from two of the largest rope and twine manufacturers, has caused values to materially advance, and notwithstanding the present difference between "fair current" and "good current" is $2\frac{1}{2}$ cents per pound as compared with $1\frac{1}{4}$ cents a few months ago, it is not unlikely that we shall see a 3-cent difference, as was the case in 1907. This large premium will undoubtedly encourage the natives to clean more good hemp, but it takes time to bring about such a change. An increase in the production of the high grades means a falling off in receipts, as there is considerably more waste in high-grade fiber and it takes longer to clean it. Therefore, although receipts at present are ahead of last year, we expect to see a gradual falling off within the next few months with a consequent stiffening in prices, especially for the lower grades, which have been more or less neglected on account of the desire on the part of buyers to get in their supplies of good hemp.

Spot hemp is steadier on the basis of $5\frac{3}{4}$ cents for superior seconds, and $6\frac{1}{2}$ to $6\frac{1}{4}$ cents for fair current.

Quotations.[1]

	July to August.	June to July.	May to June.	April to May.	Afloat U. S.	Spot U. S.
F. E. A. quality	10	10	10	10	10	10
Superior good current	$9\frac{1}{8}$	$9\frac{1}{8}$	$9\frac{1}{8}$	$9\frac{1}{8}$	$9\frac{1}{8}$	$9\frac{1}{8}$
50 per cent over good current	9	9	9	9	9	9
Good current	$8\frac{1}{8}$	$8\frac{1}{8}$	$8\frac{1}{8}$	$8\frac{1}{8}$	$8\frac{1}{8}$	$8\frac{1}{8}$
75 per cent over fair current	8	8	8	8	8	8
Midway hemp	$7\frac{7}{8}$	$7\frac{7}{8}$	$7\frac{7}{8}$	$7\frac{7}{8}$	$7\frac{7}{8}$	$7\frac{7}{8}$
25 per cent over fair current	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{3}{8}$
Fair current	6	6	6	6	6	$6\frac{1}{2}$
Superior seconds	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{3}{4}$	$5\frac{3}{4}$

[1] These quotations are in cents United States currency per pound.

SISAL.

This market has declined $\frac{1}{4}$ cent during the month, and spot and shipment are now offered at $5\frac{3}{4}$ cents. The decline was quite unexpected, as the general opinion seemed to be that the price of 6 cents would hold until the end of the season. Some business has been done at $5\frac{3}{4}$ cents, but orders at less have been cabled, and declined.

MAGUEY FIBER.

Quiet and neglected at $4\frac{3}{4}$ cents for No. 1 and $4\frac{3}{8}$ cents for No. 2. Cebu marks are quoted at $\frac{1}{8}$ cent more.

ILOILO SUGAR MARKET.

By Jose T. Figueras.

MAY.

The amount of sugar received in Iloilo from the fields and sugar mills during the month of April amounted to 271,060 piculs.

The market quotation of 8 pesos and 2 reales [1] at the close of April continued until the 4th when it raised to 8 pesos and 3 reales which continued until the 13th, when it dropped to 8 pesos and 2 reales and remained steady during the following week. On the 21st the price dropped to 8 pesos and 1 real, which continued to the close of the month.

Advices during the month of May show that there were no shipments, which may be attributed to the gradual fall in the price of sugar during the last two months.

[1] 1 real=12½ centavos.

NOTES ON MANILA MARKETS.

By KER & CO.

MANILA, *June 16, 1910.*

Latest dates.

From—	Date.	From—	Date.
London	May 19	Singapore	May 31
San Francisco	May 10	Iloilo	June 14
Hongkong	June 9	Cebu	June 11

EXPORTS.

SUGAR.

Manila.—There is nothing new to report, and quotations are unaltered.

Iloilo.—Since our last report there has been a little more movement, and the market closes quiet but firm. We quote ₱8.125 per picul bases assorted for 50 per cent Nos. 1 and 2 and 50 per cent No. 3, with dealers inclined to hold for more.

Cebu.—Nothing new to advise, crop practically over.

HEMP.

Market during the fortnight has been quiet, but closes steady with buyers of fair current (Albay quality) at ₱9.25 to ₱9.50 per picul. Receipts at all ports for the two weeks were 53,252 bales.

COPRA.

The market, which was steady at first, fell away and closes weak with downward tendency. For "Fair merchantable" we quote ₱10.25 per picul; there is not much on offer.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

APRIL, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	4,825,479	772,708	300,721	207,849	176,320	9,294		6,292,371
	Value	Dollars	127,311	26,760	8,833	7,407	6,159	293		176,763
Beef cattle	Quantity	Number	2,871		108					2,979
	Value	Dollars	62,842		1,758					64,600
Hogs	Quantity	Number			2					2
	Value	Dollars			10					10
Sugar	Quantity	Kilos	163,898	6,441	10,664	8,954	2,319	492		192,768
	Value	Dollars	11,157	441	731	714	189	56		13,288
Coffee	Quantity	Kilos	98,113	782	512	1,121	1,902	12		102,442
	Value	Dollars	20,502	347	118	287	497	4		21,755
Cacao	Quantity	Kilos	57,524	2,433	70					60,027
	Value	Dollars	13,979	669	69					14,717
Eggs	Quantity	Kilos	311,080	67	147					311,294
	Value	Dollars	19,940	3	6					19,949
Raw cotton	Quantity	Kilos	48,735							48,735
	Value	Dollars	16,978							16,978

EXPORTS.

Hemp	Quantity	Kilos	9,397,386	3,457,418		3,165				12,857,969
	Value	Dollars	923,438	375,028		290				1,298,756
Sugar	Quantity	Kilos	7,191,300	1,651,968						8,843,268
	Value	Dollars	370,776	116,450						487,226
Copra	Quantity	Kilos	4,337,394	3,874,106	406,467	108,743	243,024			8,969,734
	Value	Dollars	347,120	400,230	39,600	10,132	23,627			820,709
Cigars	Quantity	Thousands	16,342							16,342
	Value	Dollars	222,143							222,143
Cigarettes	Quantity	Thousands	2,726							2,726
	Value	Dollars	3,048							3,048
All other tobacco	Quantity	Kilos	2,425							2,425
	Value	Dollars	762							762

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

MAY, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.5	4.1	26.5	2.0	28.4	0.5	29.0	------	27.8	------	29.2	------
2	27.4	------	26.7	9.6	27.8	------	29.2	------	27.8	------	29.4	------
3	28.2	------	26.4	27.4	27.5	------	29.3	------	27.7	------	29.6	------
4	27.4	1.3	25.8	13.0	27.9	2.8	29.4	------	27.0	------	29.8	------
5	27.2	0.5	27.1	------	28.0	------	29.2	9.1	27.6	1.3	29.5	3.3
6	27.4	4.1	27.8	1.0	27.9	------	29.6	7.9	27.7	15.0	28.4	------
7	28.1	------	27.7	------	28.8	------	28.8	------	25.5	21.7	28.4	3.8
8	28.4	------	28.1	------	28.5	------	29.3	------	25.8	9.4	28.9	------
9	28.2	0.3	27.6	------	27.5	------	28.6	------	26.6	------	27.7	------
10	27.5	------	27.4	46.2	27.3	------	29.6	------	27.4	------	27.4	------
11	28.0	------	27.4	4.6	27.5	9.4	30.3	------	27.7	------	29.2	------
12	27.9	------	27.9	------	27.6	------	30.3	14.7	27.7	------	28.8	------
13	27.6	------	28.0	------	27.5	------	30.1	57.4	28.2	------	30.1	------
14	28.0	------	28.2	1.3	28.1	------	29.8	17.5	28.0	------	29.6	------
15	27.4	------	28.0	------	27.5	------	30.5	2.5	27.4	------	29.6	------
16	27.1	------	28.3	------	28.0	------	30.4	------	26.8	------	29.4	------
17	26.7	------	28.1	------	27.9	------	29.0	------	26.9	------	29.2	------
18	27.5	3.0	27.2	20.1	27.6	------	29.4	------	27.7	------	28.9	------
19	26.8	4.4	27.3	0.8	27.5	------	29.4	6.6	28.0	------	30.0	52.3
20	25.8	19.1	27.3	------	27.6	0.8	29.2	9.1	27.0	------	26.8	28.7
21	27.0	------	27.9	------	------	------	28.6	------	26.5	21.8	28.0	16.0
22	27.4	------	27.8	2.0	------	------	29.3	------	26.1	14.0	28.2	3.3
23	27.3	------	28.0	------	------	------	28.3	25.1	25.6	19.8	28.2	26.2
24	27.7	13.7	27.6	2.0	------	------	25.2	51.9	25.3	5.1	24.6	82.0
25	27.3	------	28.0	------	------	------	25.4	33.1	24.3	42.9	25.0	99.1
26	28.0	------	28.0	1.5	------	------	26.7	4.6	25.6	16.3	24.8	75.6
27	28.9	------	28.9	------	------	------	27.2	37.1	26.2	------	26.7	------
28	29.1	------	28.9	19.3	------	------	26.4	34.0	24.9	12.7	27.2	2.6
29	28.3	0.8	27.8	------	------	------	25.2	19.3	25.8	0.6	24.4	63.5
30	28.1	------	27.5	3.5	------	------	27.9	------	25.9	8.2	27.4	3.8
31	28.1	------	26.9	0.8	------	------	28.5	------	26.4	4.5	28.0	21.8

CURRENT PERIODICAL LITERATURE.

ARTICLES IN CURRENT PERIODICALS, ETC., THAT MAY BE OF INTEREST TO AGRICULTURISTS IN THE PHILIPPINES.

RUBBER.

The Science and Practice of Para Rubber Cultivation, by John Parkin (in *Science Progress,* No. 15, January, 1910), reprinted in *Tropical Agriculturist,* volume 34, No. 5, May, 1910.

Rubber Cultivation in Trinidad and Tobago, by J. B. C., in *Trinidad Department of Agriculture Bulletin,* Volume IX, No. 64, April, 1910.

Rubber Cultivation in "Peat" Soil, by H. N. Ridley (in *Agricultural Bulletin of the Straits Settlements and Federated Malay States* for October and November, 1909), copied in the *Journal of the Board of Agriculture, British Guiana,* for January, 1910, volume 3, No. 3.

The Jequie Manicoba Rubber Tree, by R. Thomson (in the *Indian Forester,* January and February, 1910), copied in *Tropical Agriculturist,* volume 34, No. 5, May, 1910.

SUGAR.

The Large Moth Borer of Sugar Cane, by F. A. Stockdale, in *Journal of the Board of Agriculture, British Guiana,* volume 3, No. 3, January, 1910.

Froghoppers in Sugar Cane, by F. W. Urich, in *Trinidad Department of Agriculture Bulletin,* Volume IX, No. 64, April, 1910.

COCONUTS.

The Bud-rot of the Coconut Palm, by James Birch Rorer, mycologist, and Serious Coconut Palm Diseases in Trinidad, by John R. Johnston, assistant pathologist, United States Department of Agriculture; both in the *Trinidad Department of Agriculture Bulletin,* Volume IX, No. 64, April, 1910.

MISCELLANEOUS.

Preliminary Report on Cacao Spraying Experiments, by J. B. R., in *Trinidad Department of Agriculture Bulletin,* Volume IX, No. 64, April, 1910.

El café en Puerto Rico, por J. B. McClelland. *Porto Rico Horticultural News,* April, 1910, volume 3, No. 4.

Cattle in the West Indies, by D. W. May, *Porto Rico Horticultural News,* April, 1910, volume 3, No. 4.

PLATE I.—(*a*) EARS OF PHILIPPINE CORN GROWN IN THE PROVINCE OF CEBU, SHOWING LENGTH OF EARS AND CHARACTERISTICS OF GRAIN. (*b*) EARS OF "MEXICAN JUNE" CORN GROWN IN 100 DAYS AT THE SINGALONG EXPERIMENT STATION, MANILA, SHOWING SIZE OF EARS AND CHARACTERISTICS OF GRAIN—MORE THAN DOUBLE THE BULK AND WEIGHT OF THE NATIVE CORN, EAR FOR EAR.

THE PHILIPPINE

Agricultural Review

VOL. III AUGUST, 1910 No. 8

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EDITORIAL.

RINDERPEST CIRCULAR NO. 1.

The spread of any contagious disease, either among human beings or domestic animals, is usually due, in a measure, to lack of information on the part of the people as to means of controlling and exterminating such disease. This is particularly true in a country like the Philippine Islands where the means of disseminating information are comparatively limited.

In connection with the work of fighting cholera in these Islands the Bureau of Health has used a circular giving concise and elementary information regarding this disease, the steps to be taken in order to avoid an outbreak of cholera, and what should be done to prevent the spread of the disease where it actually occurs. This circular has been widely distributed and has given excellent results.

A circular of a similar nature, relating to rinderpest, "Rinderpest Circular No. 1" has been prepared by the Bureau of Agriculture. This circular is published in this number of the REVIEW, and is being distributed to all municipalities and barrios in the Philippine Islands. Rinderpest Circular No. 1 contains information as to what should be done when there is an outbreak of rinderpest in any locality, how the sick animals should be cared for, and what steps should be taken to prevent the spread of the disease. This circular has been printed in the form of a poster and will be posted in a conspicuous place in each barrio of the Archipelago.

All provincial governors, municipal presidents and district health officers, in addition to all employees of the Bureau of Agriculture stationed in the provinces, have been asked to coöperate in spreading the information contained in this circular. It is earnestly desired that others who are interested in the welfare of the country should do likewise. No one factor can be of greater assistance in the complete eradication of rinderpest throughout the Philippine Islands than a general understanding on the part of the people, of the nature of the disease and the steps to be taken in controlling it.

CORN CULTURE IN THE PHILIPPINE ISLANDS.

The important place which corn holds among the staple crops of the Philippine Islands is not generally understood. According to the Philippine census of 1902 the total area at that time planted to corn in these Islands was 107,981 hectares, which

was more than three times the area planted to tobacco and 50 per cent more than that planted to sugar cane. In two provinces, Cebu and Cagayan, corn occupied a larger area than any other crop. In twenty provinces corn was the crop of either second or third importance.

Comparatively little attention has been given to the work of improving the Philippine corn crop, and yet there is probably no other line of agricultural work that would give more immediate and far reaching results. The more careful selection of seed, the better preparation of the land before planting, improved methods of planting, and more thorough cultivation of the growing crop are all lines of improvement that will not require any large increase in expenditure, or any but the simplest teaching and demonstration.

The introduction of expensive agricultural machinery, the use of commercial fertilizers, and many other lines of agricultural improvement are impracticable of consideration by the great majority of Philippine farmers because of the expense attached. The saving of the few best ears of corn from one season's crop for the next planting is, however, something that could be done by any farmer in the Archipelago, and yet this is not generally done at the present time.

We are publishing in this number of the REVIEW two articles on corn; one giving some brief suggestions regarding the culture of corn, and the other a more comprehensive review of the corn-growing industry on the Island of Cebu. It is intended to continue this work by conducting a series of coöperative demonstration experiments in several of the more important corn-producing sections of the Islands.

PHILIPPINE TOBACCO.

The opening of the United States markets to Philippine tobacco by the passage of the Payne Tariff Bill has greatly stimulated the local interest in the tobacco industry. About eighty-eight million cigars were shipped from the Philippine Islands to the United States during the eleven months, ending June 30th, 1910, and orders for more are constantly being received.

The advance of 80 per cent in the price of leaf tobacco since the new market was opened demonstrates very clearly that the tobacco growers of the Cagayan Valley, as well as the sugar growers of Negros, Pampanga, and other sugar-producing sections, have bright prospects for the future provided they hold and develop this market. In order to do this it is essential that more care and attention be given by the tobacco growers to the production of a superior product.

The demand for good tobacco is constantly increasing, and every intelligent farmer knows that it is only the best quality that pays the real profits. In the Cagayan Valley the soil and climatic conditions are exceptionally favorable for the production of fine tobacco. As tobacco growing is now, and probably will continue to be, the principal occupation of the majority of the farmers in that section, the degree of prosperity which they are to enjoy in the future will be largely dependent on the attention which they give to improving the present condition of the tobacco industry.

Heretofore the tobacco exported from the Philippine Islands has gone largely to European markets which have not been over particular as to the quality of the product.

Now that our tobacco has entered the American market it must compete with that from Cuba, Sumatra and the United States, and only the best quality is going to find a satisfactory market under this competition. The aroma, flavor, and burning qualities of the best Philippine tobacco are excellent, but the leaf that is now produced is too coarse for a good wrapper. This defect can be largely remedied, however, by improved methods of cultivation.

It is very gratifying to see the interest that is being manifested by many of the tobacco farmers, who are endeavoring to gain a better knowledge of tobacco culture, and to improve their methods of cultivation. Every effort will be made by this Bureau to stimulate this interest and to furnish such suggestions and assistance as may be possible. In this connection attention is invited to the article on tobacco published in this number of the REVIEW, which treats especially of the question of selecting and preparing a suitable seed bed. As the tobacco season advances, this article will be followed by others treating of subsequent steps in production of the tobacco crop.

DEPARTMENT OF PUBLIC INSTRUCTION.
BUREAU OF AGRICULTURE.

RINDERPEST CIRCULAR NO. 1.

MANILA, P. I., *April 1, 1910.*

Rinderpest is a contagious infectious disease which attacks cattle, carabaos, and occasionally hogs, goats, deer, and other animals. This disease has destroyed thousands upon thousands of cattle and carabaos, and has caused enormous losses throughout the Philippine Islands.

Rinderpest exists to-day in many parts of the Islands, and new outbreaks frequently occur. *This disease can be controlled, and the country can be entirely freed from it;* but this work can only be done with the active and intelligent assistance of all local officials and all persons who own or use cattle or carabaos. To assist in the work of stamping out rinderpest, observe the following precautions:

1. If any of your cattle or carabaos become sick, separate them from the well ones; but do not place sick animals near a stream. Then immediately notify the president of your municipality, and request that a veterinarian come and inoculate your animals. When the veterinarian arrives, furnish him all possible assistance and follow out his intructions.

2. When a sick animal has once been separated from the others do not change its location, except when advised to do so by a veterinarian. Keep it tied and do not turn it loose to pick its food. Food and water should be carried to such animals. Each barrio should have a shed or corral for sick animals.

3. Small animals may carry the disease on their feet to healthy cattle or carabaos; therefore, place a tight fence around the sick animals to keep all other animals, such as dogs, hogs, and chickens, from coming in contact with the diseased.

4. Keep smudges burning near the sick in order to drive away the flies.

5. Do not open the carcasses of animals that have died, except in the presence of a veterinarian, and never remove the skin of an animal which is dead of rinderpest.

6. Do not drag the body of a dead animal along the road or across fields; but burn or bury it at the place of death, if possible. If buried, the carcass should be covered by at least one meter of earth. Cover the carcass and the top of the grave with lime. Also, cover the grave with brush, or boards, to keep dogs from digging down to the body.

7. Disinfect all corrals, stables, etc. Fire and artificial heat applied in a number of ways are among the most valuable disinfecting agents. Straw, litter, bedding, ropes, feed troughs, and interior fittings of buildings, which have become infected should be burned. A very reliable method, which can be used on any kind of structure, is to pour *boiling* water over the surface to be disinfected.

8. Lime, when freshly burned, is a very valuable disinfectant. It can be used by sprinkling the dry lime over damp places about the corrals and buildings, or mixing it with water and salt to form a whitewash to be applied to surfaces, such as fences and the walls of buildings.

9. Carbolic acid, creolin, and other coal-tar products may be used for disinfecting purposes according to directions that will be furnished by the veterinarian.

10. Do not allow persons who care for sick animals, or who have been where sick animals are kept, to go near healthy animals unless they first thoroughly disinfect themselves.

11. The vessels used for feeding and watering the sick animals and all ropes and other articles used around them should not be used for the healthy stock.

12. Do not allow stock to pasture upon fields where other animals have been taken sick.

13. When animals are dying in any barrio, do not allow stock to feed upon its public pastures. Cut grass, corn, or cane from uninfected places and feed them in their sheds or corrals. Water them from a well when possible and do not allow them to drink, bathe, or wallow in the streams and swamps.

14. Corrals, sheds, and stables used for live stock should be kept dry, but not dusty. If the land is low, remove the water by digging drains or by filling the land above the water level.

15. Keep the premises clean and free from accumulated manure, litter, and soiled bedding.

16. Do not allow fowls, goats, dogs, or other animals to run at large on a farm or in a barrio where rinderpest exists.

17. Do not buy cattle or carabaos from infected provinces or islands.

18. Do not mix new cattle or carabaos, for at least ten days after they arrive at your farm, with the stock which you already have.

19. If the new animals are not accustomed to hard work, break them in slowly, so as not to weaken them.

20. All school children are requested to inform their parents of these rules.

G. E. NESOM,
Director of Agriculture.

SUGGESTIONS FOR GROWING CORN IN THE PHILIPPINES.

By H. A. Ireland,

Agricultural Inspector.

The average production of native corn in the Philippine Islands, is about 10 cavanes[1] per hectare. At the Singalong Experiment Station of the Bureau of Agriculture, an American variety of white corn called "Mexican June," yielded 75 cavanes per hectare. The latter yield is perhaps three times what might reasonably be expected as an average yield for the Islands, but the former is certainly less than half of what the average *ought* to be. The reasons for the low average throughout the Archipelago are numerous:

Selecting seed.—Insufficient care is used in the selection of seed. The native varieties are all of shallow grain, large cob types, producing a low percentage of grain. Tests made by weighing a certain number of ears, shelling them and weighing the grain, show that of the total weight of the ears 75 per cent to 78 per cent is grain. Similar tests with the "Mexican June" variety in which ears were taken promiscuously from an unsorted heap, have repeatedly shown 87 per cent of grain. The reasons for this difference are easily seen when the "Mexican June" corn is compared with the native varieties.

In selecting seed for planting, as much attention should be given to the characteristics of an ear as to its size. The large ear is not necessarily the one that yields the most corn. The seed ear should be well-shaped—nearly cylindrical and a little longer than its greatest circumference—and should have both tip and butt well filled with grain. The rows of kernels should be straight and close together and the grain firm on the cob. Flat, wedge-shaped kernels are preferable to round ones as their form permits less space between the rows and between the

[1] 1 cavan equals 75 liters.

grains. The grain should be deep—the deeper the better—each one having a length of nearly a third of the diameter of the entire ear. It is a good idea to discard the kernels from the tip and the butt of the ear as they are usually small and poorly shaped. There is no doubt that the corn crop of the Islands could be materially increased within a single year by careful attention to the selection of seed, though that alone is not all that is needed.

Preparing the seed bed.—In most cases the land is not well prepared for the seed. It is not economy to neglect the preparation of the seed bed as the best results can not be obtained from seed planted in a poorly prepared field, where the ground is hard and unpulverized, no matter how fertile the soil or how good the seed. Much of the soil of the Philippine Islands is of a stiff clayey texture that makes thorough preparation previous to planting especially important, although it may be somewhat difficult with the native implements commonly used. The ground should be thoroughly plowed when it is in the proper condition to be well pulverized and harrowed before it becomes dry and hard. Land plowed when it is too wet becomes packed and baked by the sun, and land plowed when it is too dry is generally very difficult to reduce to a suitable condition for planting. Much extra labor may result from plowing land for any crop before it is sufficiently dry or after it has become too dry to break up well. But while it is important to have the soil well pulverized, there is danger of leaving it too loose; it should be *mellow,* not *soft,* and *firm,* not *hard.*

Planting.—In many sections the method of planting is very objectionable. No hard and fast rule can be given for the proper manner of planting corn. This must depend upon the soil, and the condition of both the soil and the seed. Strong seed may be planted deeper than seed with less vitality and any seed may be planted deeper in mellow soil than in hard ground, and in light loamy soil than in clay. In every case the seed must be placed deep enough to assure sufficient moisture and to secure root hold. The amount of seed that may properly be planted depends upon the strength of the soil. Too light seeding results in an unnecessary loss from an insufficient number of plants, and over-seeding results in weakened and consequently in smaller and poorer ears. In many places fields may be seen planted in hills perhaps 50 centimeters by 70 centimeters apart, with from three to six plants to each hill. No ground will

nourish that number of plants and do it with the greatest returns to the planter. A safe rule to follow is to plant in hills one meter apart each way and not more than two or three grains in each hill. In case of doubtful seed a greater number may well be planted, but all plants over three in a hill should be destroyed as soon as they are a few centimeters high.

Cultivation.—In general proper cultivation is not given to the growing crop. Corn should never be considered too large to be cultivated, as long as it stands erect. Cultivation should begin as soon as the plants are showing well above the ground and continue until the crop is practically mature, being frequent enough to keep the ground in good physical condition and free from grass and weeds. The nature of the cultivation needed will be determined by the nature of the soil. Soils that are inclined to pack require deeper and more frequent stirring than those that are naturally light and porous. In the latter case surface tillage may be all that is necessary, while with the more compact soils deeper plowing is essential to good results.

When the corn is young and quite small the plow may be run deep and close to the row, but later cultivation, especially near the plants, should be shallower in order that the roots may not be too severely cut. Native plows are not good corn cultivators. It is just as important that the soil be kept mellow and fine while the crop is growing as that it should be well-prepared for the seed, and in compact soils this is impossible with the plows commonly used.

Fertilizers.—As a rule the soil is cropped almost continuously without fertilization. Land devoted to the production of corn year after year, sooner or later becomes exhausted and must have its fertility restored before it will give the same returns that it gave when first put under cultivation. The price of commercial fertilizers is prohibitive to the average farmer of the Islands, but there are always substitutes that may be used to advantage. Stable manure is the best of these and is nearly always available. In fact it is better than the expensive chemical fertilizers as it not only supplies plant food but improves the physical condition of the soil. Any organic matter is valuable when well-mixed with the soil and for this reason the practice of burning the stalks of the preceding crop is not a good one when it is possible to plow them under and let them return to the soil.

In sending out seed of the "Mexican June" corn to the farmers

in different parts of the Islands, the Bureau of Agriculture is desirous of having it tested as thoroughly as possible. In some sections it has given excellent results and it is believed to be well adapted to the climate and conditions of the country, and to be much superior to any of the native varieties of corn. That it may be given a fair trial, those that receive samples of the seed are urged to plant it in well-prepared soil, separated by some distance from all native corn in order that it may be kept pure, and to give it the best cultivation possible with the tools available.

CORN CULTURE IN CEBU.

By H. A. IRELAND,
Agricultural Inspector.

The agriculture of the Island of Cebu is extremely varied. From the coast line where coconuts thrive to the mountains where abacá finds suitable soil and climatic conditions, all of the important crops that are produced anywhere in the Archipelago are grown more or less extensively, and of these corn is probably second only to the coconut and its products in importance. No other food crop is grown in quantities nearly sufficient for the needs of the province; there is little ground that is specially adapted to rice culture; and it is likely that the 650,000 population, being dependent largely for their food supply upon products of the province, adopted corn as the most promising food crop for the time, labor and money invested, and, the conditions having been found well adapted to its production, they have increased the area until corn has become an important article of export.

THE LOCATION OF AGRICULTURAL LANDS.

The low price of sugar that has prevailed for several years has made sugar cane a crop of doubtful profit and has had a great deal to do with the increased interest in corn growing. Yet, the total area devoted to the crop is comparatively small. Of the 1,939 square miles comprising the superficial area of the island, a very small proportion is arable land. A strip of comparatively level land, varying in width from a few rods to several miles, extends along most of the coast, but practically the whole of the interior is too rough and broken for agricultural purposes. Of this level land a large portion is very stony and unfit for any crop but maguey; large tracts, on account of the scarcity of farm animals, are untilled; most of the arable land under cultivation is taken up with coconuts or

sugar cane so that corn is confined to small fertile patches, semistony ground where cane and coconuts will not flourish, the small valleys and lower hills farther back from the coast, and a few larger tracts where the lack of animals and capital makes cane growing impracticable. Considerable of the stony land where it is impossible to use plows is planted to corn, but this is almost negligible from the standpoint of the grain produced upon it.

DISTRIBUTION OF THE CROP.

The crop is well distributed over the island, though the comparative areas devoted to its culture in different sections vary greatly. Wherever conditions or custom make some other crop more profitable or popular corn is not extensively cultivated and in many sections where it has until recently been grown in large quantities, it is being replaced by cane since the large rise in the price of sugar. But in other districts it has long been the leading crop and because of the prevailing conditions will continue to be so. The stretch of country between the town of Carcar on the east coast and the towns of Barili and Dumanjug on the west coast, containing hundreds of hectares of low hills and narrow, steep-sided valleys, is practically one great field of corn made up of innumerable small plots, from which immense quantities of grain are sent to the railway or the coast for distribution. Toledo on the west coast north of Barili and the territory north to Tuburan, formerly one of the principal sugar-producing districts, Bogo in the North and Nagao on the east coast between Cebu and Carcar are other sections where corn contends for first place among the agricultural products.

AREA PLANTED AND AMOUNT OF THE CROP.

It is impossible to make any kind of an estimate of the total area planted to corn each year because of the irregularity of the fields and the number of small patches planted on steep hillsides, in the bottoms of dry waterways or wherever a few square meters of soil are available. Most of the plantations are insignificant in themselves, but taken together they make up a total that gives corn its place among the products of the island and puts the province in the first rank among the corn-producing districts of the country.

The amount of grain produced annually is as difficult to estimate as the area planted. There is nothing on which to base an

estimate except the reports of the municipal presidents, and at best these are but rough approximations, while at worst they are only guesses unsupported by reason or thought. However, it seems safe to put the total annual production well up in the hundreds of thousands of *cavanes*. Large amounts are consumed by the producers of which no account is ever given, while thousands of *cavanes* my be seen at almost any time in the farmers' houses, in the markets, and the *bodegas* of Chinese and native dealers.

YIELD PER HECTARE.

While the crop aggregates no mean total and is of inestimable value to the people of the province, one is led to believe upon observation of the system or lack of system of culture and the general conditions that the production ought to be more than doubled. The best yields obtained probably do not exceed twenty-five *cavanes* per hectare—and such yields are rare—while the average is less than half of that, and yields of two or three *cavanes* per hectare are all too common. To what extent climatic conditions and soil are responsible for this low rate of production, or to what extent the inefficient methods of cultivation are to be blamed for it, remains to be determined.

NUMBER OF CROPS PER YEAR.

Two crops are regularly grown each year, and quite frequently there is a third. The principal crop, called in the native dialect Panaoig, is planted during May and June and harvested from the latter part of August to early October. The second crop is put out in November and December and gathered in February and March. The third, if it can properly be called a separate crop, may come at almost any time between these. As a matter of fact the various crops are so extended and overlapped that corn may be seen in almost any stage from planting to harvest at any time of the year.

METHODS OF CULTIVATION.

Little or no attention has ever been given to the improvement of the quality of the product or the increase of the yield. Cultural methods that are worthy of the name are almost wholly lacking, especially among the poorer farmers. A few of the more progressive farmers practice a sort of system of cultivation but the great majority of them seem to think they have done all that is necessary when they have cleared the land and put the seed in the soil. With the amount of poor land used for the production of corn the average yield is bound to be low, but it does not seem

too much to say with improved implements, more careful selection of seed for planting, and more thorough tillage, the average yield may be doubled and at the same time the quality of the crop materially improved. Lack of work animals is often given as a reason for poor cultivation, and it is true that there are not sufficient animals to properly cultivate the land now under cultivation, but even with the limited means at hand a considerable improvement could be effected. However, not too much blame should be charged to the farmers. They lack instruction and are only following the customs which they have been taught to think are right. Some time will be necessary to change these customs, and although it is believed that the people are willing to learn better methods under proper teaching, some practical demonstration to prove that new methods are superior to those now in use will be required before the change can be brought about.

SEED SELECTION.

Too little attention is given to the selection of seed, probably because the importance of careful seed selection is not understood. Corn produces corn and any seed that will produce a plant seems to be considered as good as any other of the same kind. What the result of care would be in this particular alone it is impossible to say, but it is certain that the production will never be what it should until some measures are adopted to increase the size of the ear, the depth of the grain, and to improve the uniformity of the product.

PREPARATION OF THE SOIL.

Of equal importance with seed selection, if not of greater importance, and equally ignored by perhaps the majority of farmers in Cebu, is the preparation of the field previous to planting. Too many cases are seen where crop after crop is planted in the same field without the soil having been plowed or stirred in any way at all, and in too few cases is the soil really well prepared. There are reasons for these conditions though perhaps little excuse. A great many farmers who raise only small amounts of corn for their own consumption, have no animals or implements with which to break their ground, and others who may have the animals, tools and help for properly cultivating the soil seem so desirous of getting maximum returns from the land that they often plant corn between the rows of the preceding crop before the latter is mature, thus forcing the soil to produce two crops at the same time but defeating their own purpose by so doing. Much of the soil in Cebu is of such a nature that preparation of the soil is specially important and at the same

time very difficult. The soil is of a heavy clayey texture and does not pulverize readily even when handled under the most favorable circumstances. Mold-board plows are nearly useless with the slow traction of carabaos and the plows universally used, which are of the most primitive type, only break the ground up into large clods that become so hard after a few hours exposure to the sun that the native harrows constructed of short pieces of bamboo bearing projecting stubs have no effect upon them. With the soil in such condition even the best of seed would have little chance to produce vigorous, prolific plants, and yet if it is left unbroken it soon becomes so hard that seed will scarcely germinate. This condition makes the introduction of some improved style of plow that will prove practical in heavy soil, most important, but so far as is known few trials have ever been made with any of the hundreds of light tools that might prove to be adapted to existing conditions. It must not be understood that there is no friable land on the island nor that there are no farmers who understand the necessity of a thorough preparation of the soil before the crop is planted. Many men take considerable pains to clear their ground of trash and put it in the best condition possible with the means they have, but these are in the minority.

TOO CLOSE PLANTING.

Another reprehensible custom which is commonly, in fact almost universally observed, is that of too close planting. This applies to every crop grown in the island. In every part of the province may be seen fields planted in rows 2 or 2½ feet apart—in many cases even closer—with from three to six plants growing in a hill. The custom is one of long standing, having originated, probably, from the idea that he who wishes to reap bountifully must sow in the same manner, and any statements that better results may be obtained if the plants are given more space and more root room, are met with skepticism. The effect of this close planting together with the continuous cropping can be easily imagined. Year after year, for centuries, perhaps, the soil of Cebu has been giving up its fertility to feed and clothe the inhabitants and has received but little in return. The wonder is that it is still able to produce as it does. One is often impressed with the seeming lack of proportion between the soil and the crop growing upon it, and can explain the fact that soil which appears in perfect tilth, texture and composition produces a growth of weak, yellow plants, only by knowing that the soil has been cropped for generations, and understanding

the indisposition of the people to utilize any kind of fertilizer upon their lands. The lower lands, in some cases, naturally receive some fertility from the alluvial soil washed down from the hills, but the higher ground must depend for its replenishment upon the soft, easily disintegrated limestone that is everywhere present near or upon the surface. Even the most progressive farmers make no pretense of fertilizing their fields. As a rule, because of the difficulty of plowing the ground when much trash is present, such waste as corn stalks, grass, weeds, etc., which might add something to the needy soil is carefully raked together and burned. Suggestions as to the advisability of leaving this waste on the ground are sometimes met by the statement, which is doubtless true, that the ashes are good for the land, but no one seems to recognize the special importance of organic matter in the soil, and there are many who scarcely know the meaning or need of plant food.

CULTIVATION OF THE GROWING CROP.

When considering means by which the corn crop of Cebu may be increased and improved, cultivation of the growing crop should not come last. Probably, with the exception of artificial fertilization, it is more generally neglected than any other step in the production of a crop. There are always exceptions to a rule, but insufficient and poor cultivation are general. Here again, the native plows which are the only corn cultivators used except bolos, where the crop must be tended without the aid of draft animals, are largely to be blamed. These plows are even less suitable for the cultivation of the crop than they are for breaking the ground before planting, though they might be more freely used than at present to considerable advantage.

It is easy to say that poor seed planted too closely in a poorly prepared field of depleted soil, and insufficient cultivation by means of unsuitable and inefficient implements, are the causes of the low rate of production of corn in Cebu; it is far less easy to say what improvement might be effected by the adoption of improved seed, implements and methods, and how far it may be possible to introduce any or all of these factors within the next few years, or further how they may best be introduced and the people persuaded to adopt them. An effort is now being made to introduce new seed and some work has been done toward encouraging the adoption of new methods; the results are to be seen. An experiment is reported from one municipality of the province in which two generations of corn were grown to test the effects of improved culture on the quantity and quality

of the yield. On one plat the system generally followed in the locality was used, and on the other, the two being adjacent, a system approved by the experimenter was used. The seed was the same in both instances, and seed for the second generation was taken from each plat separately for planting on the same plat upon which it was produced. The results are reported as being so strongly in favor of thorough culture that the experimenter was accused of having secretly introduced and used seed of some higher yielding variety.

VARIETIES OF NATIVE CORN.

The varieties of native corn in the province, so far as they have been observed by the writer, number seven, though it is doubtful if there is sufficient difference between some of them to justify the use of separate names. It was found difficult to gather accurate and satisfactory information in regard to the number, names and characteristics of the different varieties, on account of the fact that little or no attention is given to growing them separately, and that few of the people themselves know what kind of corn they are growing. The names, also, are often confusing; different varieties may be known by the same name, or the same variety may be known by a number of different names. In some cases a word that describes a certain characteristic of any ear of corn is given as the name of a distinct variety. The following names and descriptions are submitted after observations and inquiries covering a very short time and may not be accurate in all cases. However, it can make little real difference, since anything like a pure-bred corn with a standard of perfection is not yet produced. In a general way all varieties may be classed together as "nubbins," the only essential difference being one of color with perhaps a slight difference in the length of time required for maturity.

Laay.—There are four varieties of white corn. Of these, one called *Laay* is, in some respects at least, the most promising. While no opportunity was found to compare the different kinds growing under anything like similar conditions, it is believed that *Laay* would prove to be the heaviest yielder and the best foundation for breeding an improved strain, especially on account of the greater size and depth of its grain. It matures in about four months and is fairly prolific under favorable conditions, many of the plants bearing two ears. The tassel and silk are pink or red, the husks thick and extending well over the end of the ear; the ear is rather short and thick with a large white cob and large round kernels, and is described as having the undesirable characteristic of being poorly filled at the tip.

Dalian.—Another white variety called Dalian which matures a little earlier than the *Laay,* is more popular in some sections. It is rather smaller than *Laay,* with smaller and shallower grain, but the ears fill better on the tip, and the cob is smaller.

Cochiam.—This is a "nine weeks" white corn; it is sometimes named or described as *Tiniguib* which seems to refer to the shape of the kernels, which are longer in proportion to their width than is commonly the case with other varieties. As would be expected in such a quick-maturing corn, the ears are short and small but they probably shell out a higher percentage of grain than those of other kinds as the cob is small, and the grain fairly deep.

Inagta.—The fourth variety of white corn is one of the most distinctive and easily recognized varieties in the province. Its name which seems to be generally unknown was given by some as *Inagta.* It is conspicuous for the color of its stalk, outer husks, flower and cob which are all of a dark purple, while the leaves are green with a purple midrib. The grain is not clear white but has a peculiar smoky tinge. The ears are short and thick and the kernels are of fairly good depth.

Masiaw.—The one variety of yellow corn is called *Masiaw.* This has a pink flower and a white cob. It is a poor producer, the ears being as a rule very small and poor with very shallow kernels. It is not extensively grown as, aside from its poor yielding qualities, it is considered unsavory as a food.

Bolero.—The darker colored varieties of corn are represented by all shades between red and black with a corresponding number of names, but probably there should not be considered more than two distinct varieties. The red, which is more or less commonly known as *Bolero,* is not popular. It ripens in about 100 to 120 days. The flower and cob as well as the grain are red; the ears are small and the grain shallow.

Tapol.—The black corn, universally called *Tapol* is more in favor although it is not often seen in the markets. The flour is pink, the cob white and the grain a very dark blue or nearly black. It is rather softer than most other corn and is said to be more seriously attacked by the weevil. On this account it is not extensively grown although it is considered superior as a food. Between *Tapol* and *Bolero* are blue and red types that are given separate names, but they seem to be merely variations of the two varieties mentioned and need not be considered.

All of the above varieties are flint corns with small germs containing a very small proportion of starchy material. The latter quality is undoubtedly an advantage as a protection against the

weevil, it is also considered as such from the standpoint of its use as a food, as only the corneous portion of the endosperm is eaten. In the preparation of the grain for food, it is first ground coarsely in crude mill stones of native manufacture, after which the germs, fine meal and part of the bran are carefully sifted out. This portion is utilized as hog feed, and the remaining part, consisting of flinty grains usually a little finer than unbroken rice is used as food. It is called *arroz* and is cooked and eaten in the same manner as rice. On account of this custom it is doubtful if the corn that the Bureau of Agriculture is trying to introduce in Cebu will become popular. It is very much softer than any of the native corns and contains much less of the desired "*arroz*" and, even if it proves to be superior in the yield per given area, in the absence of any experience with soft corn and of mills suitable for converting corn into a fine meal, it is not likely to be generally adopted for some time to come.

DISTRIBUTION AND MARKET FOR THE CROP.

The annual crop in Cebu is probably no more than could be consumed within the province, yet large amounts are exported every year, the Province of Bohol receiving the principal part of the export. The town of Carcar is the principal distributing point. Situated as it is on both the coast and the railway and at the end of the road across the island which penetrates one of the largest corn-producing districts, it draws from a large territory and thousands of *cavanes* may often be seen at one time in its market. Local merchants buy the shelled grain, which is brought to the market in small quantities, from the producers and either store it for future speculation or send it out at once to other points. So much is exported in this way and the merchants keep the price so high that corn is sometimes imported from other islands for speculation or to supply the local demand, and this imported corn may sell at a lower price in the city of Cebu than the native product can be bought for. The price to the producer varies with the supply and demand, and the season. At times it may drop as low as ₱1.75 per *cavan* while at other times scarcity or competition may run it as high as ₱4.50. The average is probably not far from ₱3 per *cavan* of fifty-five kilos.

Overproduction and the dimunition of the price below that at which a fair profit will accrue to the farmer is not to be feared. When the locusts which now do untold damage to the growing crop each year are exterminated and by thrift and industry the production is increased beyond the needs of the people of the province and of the neighboring Province of Bohol,

Manila will be able to furnish a market for the surplus. At the present time there is a great deal of corn along the western coast that might be placed on the Manila markets to the mutual advantage of the producers and the Manila dealers if the question of direct transportation at reasonable rates could be solved. This territory contains some of the most productive land of the province but is nearly inaccessible, and for this reason is not as well developed as it might otherwise be. Except between Barili and Carcar it is impracticable to transport produce overland to the railway where it may be carried to Cebu for shipment to points outside of the province, and the expense of transportation by means of the small boats that call along the coast, to a shipping point, together with the transportation to Manila, is prohibitive. Direct communication between these points and Manila would be of great benefit to both Cebu and Manila.

In the writer's opinion, as has been suggested before, a series of coöperative experiments in corn growing could be conducted most profitably between the Bureau of Agriculture and some of the land owners of Cebu at a very small cost to either. There are progressive men in every municipality who would be more than willing to coöperate with the Bureau in this work, and the results, in the form of something visible and practical, should certainly have a great influence for good upon the production of corn and the corn growers in Cebu.

THE RICE INDUSTRY IN BURMA.[1]

The greatest rice mill of the world lies here at Poozoondoung, on the Irrawaddy River, below the port of Rangoon. It belongs to the Bullock brothers, who own other large mills and export thousands of tons of rice every year. Burma is about the best rice patch on the bosom of old Mother Earth. The lower part of it is a garden devoted to the cultivation of the rice crop, and more than half of upper Burma is devoted to rice raising. The country has altogether rice areas equal to the state of Ohio, and its annual exports of this grain are more than two billion pounds. This is enough to give every human being on earth all the rice he could eat in one day, and still leave enough over to make a pudding for every man, woman and child, as well as sprinkle all the brides and grooms of the year. Rice is the money crop of Burma. It takes the place of wheat, corn and cotton in the United States. The exports sell for millions, and the people are rich or poor as the rice grows well or ill.

INCREASING THE RICE CROP.

The British government appreciates how much the prosperity of the country depends upon rice, and it is doing wonders in increasing the crop. It has an agricultural department whose efforts in this regard correspond with those of our department at home. It is studying seed selection, increasing the irrigated territories, and making forecasts showing the possible yield. It has its agents in every part of the country, and their reports upon the rice crop are more accurately made than the United States reports upon cotton. During the past five years, in which a total of 13,000,000 tons was raised for export, the government forecasts were only 3,000 tons out of the way, and the estimates came largely from the local officials. Burma is a land of villages. Most of the people live in little settlements of thatched huts raised upon poles; and they go outside to work. Every village has its head man, who reports to the government the number of acres his people will plant. His figures are sent

[1] Extracts from "Rice Rules in Burma," by Frank G. Carpenter, from The Detroit Free Press, April 10, 1910.

to the county officials, and they send the estimate for their district on to the officials of the province, the last calculations being made at Rangoon. I do not know what Uncle Sam is doing in this line in the Philippines, but I venture he could learn much from the British in Burma.

BURMA'S BIG RICE MILLS.

The grain is harvested as paddy. In the field it looks not unlike wheat or oats, but every kernel has a husk on it and this husk sticks to the kernel as though it were glued. When the grain is ready for shipment to the mills it looks much like wheat grain unthrashed, save that the rice husks have neither heads nor beards and they stick tight to the kernels. It takes quite as much work to get them off as to grind thrashed wheat into flour, this is the work of these rice mills.

The Poozoondoung mill covers as much ground as any of the large flour-grinding establishments in the United States. It has buildings of five stories, with single rooms as large as a good-sized garden patch. I entered one on the ground floor which was packed to the ceiling with rice paddy in bags. It held more than 2,000,000 pounds, and other rooms of equal size adjoining it were filled with the cleaned rice awaiting shipment.

UNLOADING THE PADDY.

Rice paddy is brought here from all over Burma. It is floated down the streams to the Irrawaddy river and towed to Rangoon in flatboats and barges by steamers. The unloading is done by East Indian coolies, many of whom are quite pretty young girls. They are black, lusty and buxom, bare-armed and bare-necked, and often with legs bare to the knees. Not a few of them wear gold buttons in their noses and rings in their ears. They have armlets and anklets and I saw three with rings on their toes.

These girls carry the rice from the boats to the mills in baskets of fifty pounds each. They lift the grain to their heads or shoulders, and carry it up and down the banks of the river over a plank roadway. Their hours are from daylight to dark, and their average pay is less than two cents gold an hour. I am told that they are quite as strong as the men, and that they do better work although their wages are lower.

They save money at two cents an hour, and most of them make savings banks of their persons. Nearly every one I saw had more or less jewelry upon her. I remember a girl of eighteen with silver bracelets covering her arm from wrist to elbow, and heavy anklets of silver on each of her legs. The lobes and rims of her ears were pierced with gold rivets, the gold ring in

her nose was as big around as a saucer and hung down around her mouth and when she ate lunch she stuffed the rice in through the ring. She was a Kling from southern India, and her husband, a straight black man in a white cotton waist cloth, worked with her.

HANDLING THE RICE IN THE MILL.

In another room men were handling the finished product. The white rice is bagged up in sacks of 226 pounds. These are carried by East Indian coolies into the warehouses and are piled up in stacks. Each lifts one of these bags to his shoulders and runs up an inclined roadway. It looks easy and three Harvard university athletes, who visited the mill recently rather sneered at the strength of the Hindoos, saying that any good man could carry such a load up a plank. Thereupon the manager asked one of them to try it. He did so, getting the bag on his back without very much trouble. He was able to make his way across the room, but when he tried to go up the incline the weight pulled him over and he fell with the rice to the floor.

This same college crowd tried to pick out the broken rice grains in competition with the Hindoo girls, thinking they could work quite as fast, but had to give up in despair. The rice is of various grades, according to the broken grains in it, and every shipment has to be tested by counting the number of whole grains in a fixed quantity.

POLISHING THE RICE.

It seems strange to think of polishing rice like your best silver spoons. But that is what is done in this mill. The machinery is the finest known to the trade. The paddy or rice in the husks is first winnowed and then carried to the top story, where it is passed through grinding stones so carefully set that they pare off the husk without breaking the rice.

The stones are of a composition harder than iron, and they have to be roughened every week by skilled Hindoos who understand how to repair them. After this process the rice is again winnowed. It goes through countless fans and shaking sieves, being again carried to the top of the mill and then descending by gravity from floor to floor, it is shaken grated and cleaned at every turn. After the husk is off the kernels are polished. This is done with chamois skin, the grains being thrown back and forth against a roller covered with this material. The chamois cylinder goes around at the rate of 500 revolutions a minute, and when the rice flows out it is as clean and white as the tooth of a baby.

It then falls through a chute into bags and is sewn up by Indian girls, when it is ready for shipment abroad. Much of the export is to England, France, Germany, and Holland, but a great deal goes to India, China and other parts of the Far East. The Burmese rice is much better than that of Hindustan, and it brings such high prices that the natives ship their own product abroad and eat the cheaper imported rice which is sold in the markets.

LABOR CONDITIONS IN BURMA.

Speaking of the coolies in the mill brings one to the Hindoo invasion of Burma. The East Indian coolies are brought here by the shipload. They are carried across the Bay of Bengal, a distance of 1,000 miles or more, for less than a dollar, and by the mail steamers they can come here from Calcutta for about 64 cents gold. In other words the passage costs them about one-twelfth of a cent a mile, at which rate one could go from New York to Washington for less than a quarter of a dollar and from the Atlantic to the Mississippi for about a dollar.

The Burman does not like to work. He despises money, and when he gets a little ahead he acquires merit by giving it out in charity, establishing a drinking fountain or putting a plate of gold on some Buddhist shrine. The Hindoos, who work for almost nothing at home, can earn as much as $5 a month here, and the land seems an El Dorado to them. As it is now more than half the population of Rangoon is East Indian, and there are thousands of Hindoos in every large town.

EAST INDIAN MONEY LENDERS.

The invasion of Burma is not confined to the laboring classes. There are many Indian merchants and "Chitties," or Indian bankers. The latter do about all of the loaning to the individual farmers. They lend at from 25 to 40 per cent a year to the Burmese, taking mortgages on their crops. The laws are such that the Hindoos can not own land but the crops can be mortgaged, and the Chitty puts his agent on the farms to see that he gets his loan and interest out of the sales.

These Chitties are the queerest bankers imaginable. Our ideal of that profession is a fat, sleek, well-dressed man who looks prosperous and has the finest house in the town. The ordinary dress of the Hindoo banker would not cost an American dollar, and he lives in a hovel. His black skin is bare, with the exception of a rag of thin cotton around the loins, and a calico jacket which ends at the waist. His shaved black head is often free of turban or cap, although he may have ashes smeared over

parts of it to show his caste or religion. The Chitties come from near Madras. Their only idea is to make money breed, and they save every cent. Some of them are quite wealthy, all are said to be honest, and their word is accepted by the banks for large sums. Some start in Rangoon as clerks at $12 gold a month. They will live on one-third of that amount and loan the rest out at interest. When they have accumulated about 10,000 rupees they go back home and live economically thereafter on the interest of their holdings.

Outside of the Hindoos most of the banking is done by the British, who have four large banks in Rangoon. These are the Hongkong and Shanghai bank, the Chartered Bank of India, Australia and China, the National Bank of India, and the Bank of the Netherlands. All of these do a general banking and exchange business; their interest rates vary according to the season of the year; they get from 10 to 17 per cent, receiving most during the seasons for planting and harvesting the crop.

THE PREPARATION AND CARE OF TOBACCO SEED BEDS.

By B. E. Brewer,
Tobacco Specialist.

As soon as the present tobacco crop is disposed of the farmers throughout the tobacco-producing sections of the Islands will begin to make preparations for growing another crop. The most important step in the culture of tobacco is the preparation and care of the seed beds, which requires considerable judgment, both in the selection of the location and the soil, and in the preparation of the land. If the seed bed be neglected, a partial or total failure of the crop is liable to be the result. To have an abundant supply of good healthy plants to select from is the surest foundation for a good tobacco crop.

Owing to carelessness on the part of many of the tobacco growers in the selection of locations for their seed beds, hundreds of beds are destroyed every year in the Cagayan Valley by the floods which frequently occur in this locality during this season of the year.

In view of the importance of this matter of seed beds, this article has been prepared in the hope that it may offer some useful suggestions to readers of the Review who are interested in the cultivation of tobacco.

The average tobacco grower in the Philippines generally sows to seed an area several times larger than is ordinarily required to furnish the number of plants necessary for the transplanting of his fields, and yet, he frequently fails to produce a sufficient number of plants to supply his needs. The reasons for this are that the farmer fails to obtain his seed from good healthy individual plants, the general custom being to gather seed from any and all plants, suckers included. The small pods from the main plant and those from the suckers contain many undeveloped seeds which will not germinate, and if they do germinate, a weak sickly plant is the result. If such plants are transplanted to

the field, it does not matter how rich the soil may be; they will not grow well and produce a large thrifty stalk of tobacco. It is therefore necessary that these undesirable seeds be eliminated and only the heavy seeds used for sowing the seed beds. With this end in view a machine for cleaning tobacco seed, that is, for separating the light seed from the heavy, has been constructed in the Bureau of Agriculture. Any farmer who desires to have his tobacco seed cleaned can have this work done by sending the seed either to the Bureau of Agriculture in Manila, or to its tobacco Experiment Station at Ilagan, Isabela.

Seed sent to either of the above places will be cleaned and returned to the sender free of charge. As small packages of seed can be sent through the mail with but little cost attached, it is earnestly hoped that the farmers who are engaged in tobacco culture will take advantage of this opportunity for improving the yield of their crop.

An ounce of carefully prepared tobacco seed contains from 300,000 to 400,000 seeds. A large percentage of these however will not germinate, yet, allowing for the imperfect seeds, from 30,000 to 40,000 plants should be secured from an ounce of good heavy seeds, but the plants obtained will not all be of a uniform size. Many of them will be weak and unhealthy and should not be transplanted to the field. In order to secure a sufficient number of good strong plants for transplanting the entire field at one time it is necessary that the grower sow an area to seed several times larger than would otherwise be required. By thus having a large number of plants to choose from one is able to select only the largest and strongest for the field. Under ordinary conditions a seed bed containing eighty square meters should furnish an abundance of plants for transplanting one hectare, and to sow an area of the above size, two ounces of seed will be ample. It is advisable to sow two or three beds at intervals of ten days apart, each capable of supplying enough plants for transplanting the entire field, then if floods or insects should destroy one bed, the farmer may rely on the others for transplanting his crop.

TIME OF SOWING SEED BEDS.

As a general rule seed beds are sown during the months of September and October, before the rainy season begins, in order that the young plants may secure plenty of moisture and will be large enough to transplant by the close of the rainy season.

A properly prepared seed bed should furnish plants large enough to transplant in from six to eight weeks from the time of sowing the seed. Transplanting should be done just as soon

PLATE II.—PLANT OF STAND-UP BURLEY TOBACCO, SHOWING METHOD OF SAVING SEED UNDER BAG TO PREVENT CROSSING.

as the plants are large enough, that is, when they contain four or five leaves. If tobacco plants are allowed to remain in the seed bed until a crowded condition is reached they are apt to become stunted, and such plants will not grow properly on being transplanted to the field. It is desirable to get as early plants as possible, for early plantings are not as liable to suffer from the attack of worms as late plantings are, besides it is a universal rule that early tobacco is always larger and produces more marketable leaves of better quality than late tobacco. The early planting secures the benefit of the moisture stored in the ground from the late rains, whereas late tobacco is apt to suffer from lack of moisture in the soil.

THE LOCATION AND PREPARATION OF SEED BEDS.

The question of selecting suitable locations for seed beds, where there is danger of their being destroyed by floods or heavy rains, is a very important one to the tobacco growers in the Philippine Islands. When the plants have reached a size almost large enough to transplant to the field and are then destroyed by a late flood, as was the case this past season in a few towns along the Cagayan Valley, it is then too late to resow the bed and the farmer is unable to raise a crop of tobacco. Where seed beds are sown near the river and are overflowed, but not carried away, a fine sediment is generally deposited over them and when the water recedes and the sediment is exposed to the sun for a few hours, it is baked into a hard crust and the plants under it can not grow through this layer, and soon perish.

Frequently plant beds are placed out of danger of floods or high waters from the rivers, and yet, they may be located in a basin or sink which has no outlet and into which the surrounding territory is drained. After a heavy rain a pond is formed and the plants are covered with water, which can only escape by seepage. Where plants are covered with water for several days they will be drowned out, and when submerged in this manner they become very tender and on being exposed to the sun are soon killed.

Occasionally seed beds are placed on a slope from which the water runs in large streams after a heavy rain, and if such beds are not well protected by a deep ditch on the upper side, many of the plants are carried away, and frequently the entire bed is destroyed. The most important thing to be remembered in the selection of a location for a plant bed, is, to place it where there is no danger of its being destroyed by floods or heavy rains, for if once destroyed it must be resown and this causes the crop to be late and of an inferior quality.

The best soil for a seed bed is a rich, friable, black virgin loam, containing a trace of sand. This kind of soil offers an advantage over soils containing clay, in that it does not bake or pack after a heavy rain. A black soil absorbs to a greater degree the rays of the sun and brings forward plants several days earlier.

Soil of the above description can be found in abundance along the upper flood plains of the Cagayan Valley and especially in the forests of the foot hills. It may often be found necessary to go a considerable distance from the field intended for tobacco before a desirable soil, free from all danger of destruction by floods is found, but it pays to do this in the end as the most dangerous element has been eliminated; and if proper attention is then given to the preparation and care of the seed beds the farmer is sure to have an ample supply of plants.

After the selection of a suitable location, comes the preparation of the soil. All undergrowth should be removed and the soil plowed to a depth of 12 or 15 centimeters, it should then be sterilized by heating it to a depth of 6 to 8 centimeters. The object of sterilizing the soil is to kill all the weed seeds, ants and fungi that are liable to injure or hinder the growth of the plants.

Brush and logs are generally used for burning seed beds and a good supply of both may be found along the Cagayan Valley. Every year the floods carry down large drifts of logs and frequently these drifts are deposited on the tobacco fields and have to be burned. If brush is used for burning the seed bed, it should be cut several days before being used in order that it may dry enough to burn. It is preferable to use green material as it burns slower and creates more heat than dry material, which is soon consumed by the flames. In using brush it should be placed on the bed nearly vertical or leaning at an angle of about 45 degrees; it should then be weighed down with chunks of wood or a few small logs, as it is desirable to have the fire near the ground so the heat will penetrate it better.

In using logs for burning the soil, poles should be placed lengthwise of the bed and the logs laid across these poles, leaving a space of several inches between the logs and the ground. In using either brush or logs the fire should always be started on the leeward side as they will burn more slowly and heat the soil better than if the fire is started on the windward side.

The fire should be kept burning in one place until the ground is thoroughly heated and then moved. In using logs they may easily be moved along by turning them over on the poles until the entire bed is satisfactorily treated, but if brush is used it may

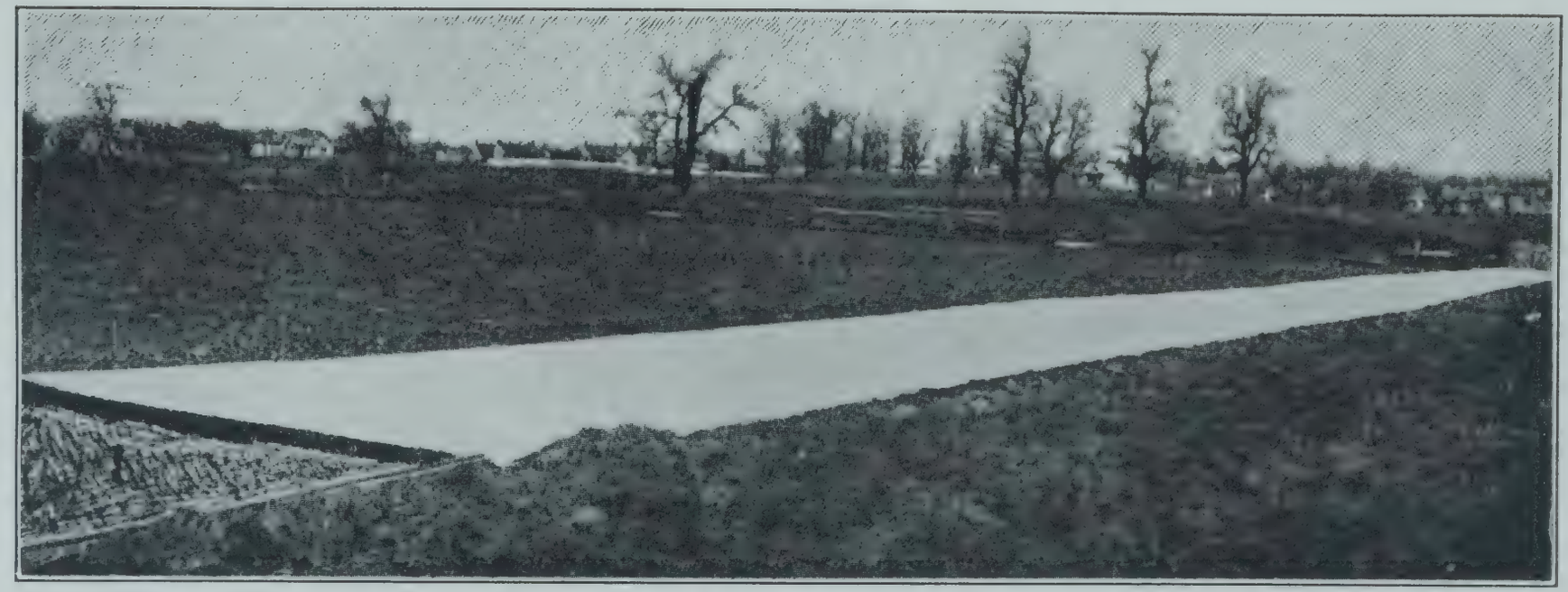

PLATE III.—PLANT BED IN KENTUCKY, SHOWING CANVAS STRETCHED OVER TOBACCO SEEDLINGS.

be necessary to replenish the supply before the soil is heated to a sufficient depth.

After the burning is completed, the surface of the ground should be raked down level in order to preserve, as long as possible, the steam that has been generated from the moisture in the soil. After the ground has cooled off thoroughly, the soil should be finely pulverized and the seed scattered broadcast. On account of the tobacco seeds being so small it is a difficult matter to get them distributed uniformly over the surface of the bed, and it is advisable to mix the seed with a few handfulls of finely pulverized soil or wood ashes, in order that they may be scattered more uniformly.

A frequent mistake is made in using too large a quantity of seed. It is far better to err in using too little. In the latter case the plants will be large, healthy, low and stocky, and will be strong enough to withstand a very hot sun, and may be transplanted in the field when there is but little moisture in the soil.

When plants are crowded in the seed bed the stems are small, slender and delicate, and they have such weak constitution that many of them die on being transplanted to the field. The vitality of those that live is so small that several weeks are required for them to get a firm hold on the soil and start to growing.

It is impossible to secure a uniform stand with such plants, and the tobacco field is of uneven growth, which both reduces the yield and impairs the value of the crop.

After the seeds have been scattered over the surface of the ground it is necessary to pack the earth firmly around them in order that they may absorb moisture from the earth particles. This may be done by pressing the surface of the bed with a broad board or by tramping it with the feet. If the ground on which the bed is located slopes to any extent a deep ditch should be constructed on the upper side to carry off the surplus water, or, if the ground is level, the surface of the bed should be raised several inches above the surrounding territory before planting the seed, as the tobacco seeds are very light and a slight rain will often carry them away or bunch them on the bed.

THE SHADING OF TOBACCO SEED BEDS.

Shading the seed beds is generally practiced throughout the Southern Islands, and in the knowledge of this particular phase of tobacco growing, the farmers of Cebu and Panay may be said to surpass those of the Cagayan Valley, where shading is not practiced, and is almost unheard of. In America, Cuba and Sumatra a special cloth is used for this purpose, and if properly

arranged, it not only gives the desired shade, but also protects the young plants against the attack of insects.

The advantages of shading the plant beds are as follows:

1. After a rain when the seeds first begin to germinate, the shade protects the young sprouts from the rays of the sun, and also conserves the moisture on the surface of the ground, so that the young plants are able to take root and grow more rapidly than if they were exposed to the direct rays of the sun which often kills the young sprouts.

2. Before the roots have secured a sufficient hold on the soil one or two days exposure to the sun will kill many of the seeds.

3. It must be remembered that the tobacco seed is quite small, and that only a very small amount of food material is stored in the seed coat, so that after a seed once starts to germinate this stored up food material is soon exhausted and if by this time the plant has not developed a root system capable of supplying nourishment from the soil, the plant will die. If the bed is protected by a shade the root system develops much quicker and a thriftier and better stand of plants is obtained.

4. Another advantage offered by shading, is, that the tobacco plant, when young, is very shallow rooted and several days strong sun dries out the ground to a depth below the root system of the plant and it stops growing and remains stationary for want of moisture.

After the plants are almost large enough to transplant, the covering used as a shade should be removed for a few hours during the mornings when the sun is not strong, and replaced during the day when the sun is hottest. After a few days the shade should be entirely removed. This is done in order that the young plants may gradually become accustomed to the sun, so that on being transplanted to the field they will be better prepared to stand the exposure. In the Visayan Islands the fronds of the nipa palm are used for shading the seed beds and they are considered excellent for this purpose. If no nipa swamps are near, a lattice work may be constructed out of bamboo that will serve the purpose as well, and if stored in a dry place when not in use, a covering of this kind may be used for several years.

HOW TO PRODUCE GOOD TOBACCO PLANTS.

SUMMARY.

1. Save the best plants in the field for seed plants. During the growing period of the crop a constant search for good plants should be made by the grower.

2. When good plants are found they should be marked by placing a stick in the ground near them, so that they may be easily found afterward. When the seeds are ripe only the larger pods should be gathered. The seeds should then be thoroughly cleaned so as to eliminate all the light seeds that are likely to produce weak, unhealthy plants.

3. Select a location for the seed bed free from all danger of destruction by floods.

4. Before planting the tobacco seed, burn the ground thoroughly in order to destroy all weed seeds, ants and fungi.

5. After the seeds are sown, protect the bed by a shade constructed either from the fronds of the nipa palm or a lattice work of bamboo.

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RESOLUTIONS PRESENTED BY DELEGATES TO THE AGRICULTURAL CONFERENCES AT THE CARNIVAL.

[February 7 to 10, 1910.]

By E. A. CODDINGTON,

Secretary of the Insular Agricultural Association.

The resolutions published herewith were transmitted to the Secretary of the Insular Agricultural Association by the Committee on Resolutions without any indorsement or comment whatever. None of these resolutions, therefore, have been officially approved either by the committee or by the association. Inasmuch as different delegates to the conferences were sufficiently interested in certain subjects to present these subjects to the Association in the form of resolutions, and as these resolutions were considered by the assembled delegates, it is believed that their publication is desirable.

1. A resolution regarding the importation and immunization of cattle was introduced by Mr. Joaquín Gonzalez and seconded by Mr. Apolonio Mendoza. Mr. Gonzalez in this resolution asked that a law be passed authorizing the Bureau of Agriculture to import cattle from other countries, to immunize them and sell them to farmers, allowing the farmers to make payment by installments. Señor Miguel Malvar further moved to amend this resolution by asking the government to provide free transportation for cattle and carabaos from China, as well as selling them to the farmers at cost, as has already been done with rice. He also asked that municipal health officers be required to inoculate all cattle within their jurisdiction, at least once a year.

The attention of readers of the REVIEW is invited to the fact that this plan has previously been tried in these Islands and was not a success. In the first place, the immunization of cattle against rinderpest is a rather expensive process and experience has shown that the majority of farmers

are either unable or unwilling to pay for this cost of immunization. With respect to the suggestion of inoculating all cattle once a year, such inoculation is unnecessary unless the animals are in a community where disease exists. Those who desire further information on this subject are referred to an editorial "Draft Animals in the Philippine Islands" by the Director of Agriculture in the June number of THE PHILIPPINE AGRICULTURAL REVIEW.

II. Mr. Abraham de Peralta, of Ilocos Norte, introduced a resolution asking that a law be passed, or an order issued by the Bureau of Agriculture requiring the inspection and disinfection of all farm animals imported into the Philippines from foreign countries, that these animals be thoroughly immunized before sending them to the provinces and that the purchaser of each immunized animal be furnished with a certificate of such immunization by the proper officer or authority. Also, that veterinarians in the provinces hold conferences with the owners of farm animals, and instruct them regarding the care and preservation of the health of such animals.

Regarding the inspection and disinfection of animals imported from foreign countries, the readers of the REVIEW are referred to General Order No. 15 of the Bureau of Agriculture and Executive Order No. 36, both of which were published in the July number of the REVIEW. In regard to the holding of conferences by veterinarians, this plan has already been adopted by the Bureau of Agriculture, but thus far all veterinarians in the field have been so busy looking after the actual outbreaks of disease and attending the sick animals that they have had comparatively little time for holding conferences. All veterinarians in the Bureau of Agriculture are directed to do as much as possible toward instructing the owners of animals with reference to their care and protection from epizoötic diseases. In this connection the readers of the REVIEW are also referred to the work that is undertaken by the Bureau of Education under the head of Civico-Educational Lectures, provided for by Act 1829, under the provisions of which popular instruction regarding the care of animals and the nature and cure of epizoötic diseases of domestic animals has been taken up by the schools.

III. Señor Miguel Malvar presented a resolution asking that the Bureau of Agriculture purchase all of the coffee produced each year on the Hacienda Genato of the town of San José, in Batangas Province, and that this seed be distributed while fresh to all of the coffee-growing municipalities in the Islands, which he believed would soon become coffee producers and thus increase the production of coffee in this country. Señor Malvar stated that the coffee trees on the Genato plantation are very similar to the trees which are commonly known as *mabolo*. Also, that the Bureau of Agriculture distribute gutta-percha seed in the largest possible quantities, as he believes that this plant can be successfully grown in this country; and, that the Bureau should also distribute seed of the best varieties of abacá to the hemp

growers of these Islands, so that the poor varieties which are grown on many plantations can be destroyed and the better varieties planted.

IV. A resolution was introduced by Señor German Magpili, of La Laguna; Señor Leon de Castro, of Sorsogon; Señor Julio Agcaoili, of Ilocos Norte; Señor Pedro Perlas, of La Laguna and Señor Angel Lopez, of La Union, asking that some assistance be given to farmers toward getting satisfactory titles to their lands in order that they may borrow money from the Agricultural Bank for purchasing farm animals, machinery, etc.

This question has already been discussed by Señor German Magpili, Señor Leon de Castro, Señor Julio Agcaoili, Señor Pedro Perlas, Señor Angel Lopez and others interested in this subject, in the minutes of the Agricultural Conferences published in the May number of THE PHILIPPINE AGRICULTURAL REVIEW. The proposed plan for surveying and giving titles to lands is outlined under the title "A Reform in the Land System," under Current Notes in the April number of the REVIEW.

V. A resolution was introduced by Señor Julio Agcaoili, asking that steps be taken to protect private associations which own or are constructing irrigation projects, especially in those provinces where there is no general irrigation system provided for under the present plans and projects of the Irrigation Division of the Bureau of Public Works.

VI. Señor Agcaoili also presented a resolution, asking that the provincial governments be authorized to hold provincial or district expositions and use at least 10 per cent of the Provincial Fund for prizes for the best agricultural products exhibited.

This last resolution has been the subject of a great deal of discussion by members of the Philippine Assembly and others interested in the development of agriculture in these Islands. Bills for this purpose have on two different occasions been presented to the Philippine Legislature.

VII. Delegates Mendoza and Yason of Bataan, and Señor Perlas of La Laguna, introduced the following resolution: That some remedies be provided against the negligence and bad faith of laborers in keeping their contracts with farmers, especially when they have been paid money in advance for their labor.

VIII. Dr. Francisco Liongson and Señor Francisco Hizon introduced a resolution asking that the government permit the importation of laborers under certain specific restrictions for a given period in such numbers and for such provinces as desire them.

IX. Dr. Simplicio de Ocampo of Nueva Ecija presented a resolution recommending that money be set aside for prizes for the best primers and readers for use in the public schools on

certain lines of agricultural work, such as rice growing, sugar growing, hemp growing, coconut growing, tobacco growing, etc.

The preparation of elementary readers on the above-mentioned subjects has been considered by the officials of the Bureau of Education and certainly has the heartiest approval of everyone interested in training the coming generation for the calling which many of them must of necessity follow.

Dr. Ocampo also recommended that an agricultural demonstration farm be established in every agricultural province, or in every two adjoining provinces, that these farms carry on general demonstration work, and that they be supplied with high-grade farm animals for breeding purposes.

Such farms are being established in different parts of the United States, but the expense connected with this work is so great that it would not be practicable for the Government to establish more than a few of these farms in the leading agricultural sections.

Dr. Ocampo also recommended that a careful statement, showing the causes, symptoms and cure of the common animal diseases be prepared, translated into all the dialects in the Islands, published, and distributed in bulletin form for the information of the people.

X. Señor Angel Lopez introduced a resolution in which he advocated the electing or appointing of permanent agricultural committees in municipal councils to look after the development of agriculture, the care and protection of farm animals, and the sale of farm products.

This resolution would seem to be an excellent one and it is believed that it would be desirable to have a law creating an agricultural committee in each municipality and an agricultural member on every municipal board who would coöperate with the agricultural committee.

XI. At the close of the conferences a resolution was introduced by Señor Cirilo Bayaya, Delegate from Leyte, which was unanimously approved by the delegates, expressing their thanks to the Bureau of Agriculture for its work in calling and organizing the conferences, to the Directors of the Carnival Association for providing a place of meeting for the delegates, and to the officers of the association for the courtesies extended by them during the days on which the conferences were held.

ENEMIES AND DISEASES OF PINEAPPLES.

By H. C. Henricksen and M. J. Iorns.[1]

DISEASES AND INSECTS.

With a soil properly drained and with good culture, few plants are as free from pests and diseases as the pineapple. It is almost axiomatic that trouble with pineapples means bad management. The troubles thus far known are chiefly due to one of three things: First, an ant and its associate, a mealy-bug; second, wilt; and third, spike.

The station has published a circular on the ant and mealy-bug, with methods for extermination (Circular No. 7), which may be had on application, so the subject will not be discussed here. It may be said in passing, that if in applying fertilizer it is mixed with one-third to one-fourth of its bulk of tobacco dust, or even if tobacco dust alone is thrown in the crown, it will usually prevent the appearance of these pests and will oft-times cure incipient attacks. The tobacco dust also acts as a stimulant to the plant, making it a valuable help to the pine-apple grower. In using the dust its value lies in its freshness and strength; it will keep for long periods where it is dry, but leaches quite readily and ferments if allowed to get wet.

WILT.

The disease known as wilt is quite easily recognized, and if taken in time may be controlled. Apparently it is transmitted from one generation to the next, so slips from infected plants should never be chosen. According to the best information obtainable, the disease is a fungus one, but it acts in a way not clearly understood, and should be met with extreme measures at its first appearance.

Characteristics.—Usually the first sign of the disease is a loss of color, the leaves changing from green to red, then yellow,

[1] Extracts from "Pineapple Growing in Porto Rico" in Vol. 3, No. 5 of The Porto Rico Horticultural News.

and finally brown and withering. The withering begins at the tip as a rule, and as it passes down the leaf loses its stiffness and droops, producing the wilted appearance which gives the disease its name. If the attack is not too severe the plant may produce a fruit, but it is usually of poor quality and ripens prematurely.

On cutting off the plant at the base the roots can be traced as dark broken or black points in the stem tissue. A more careful examination shows the whole root system to be diseased. Under the microscope the root hairs are seen abnormally developed, and in the diseased parts the fungus threads can often be found, showing that the disease enters from the soil.

Cause.—It is often impossible to tell just how the trouble starts, as it may break out simultaneously in widely separated places. It can probably exist in the soil under some conditions, though Australian investigators claim that it also occurs where a field is cropped too long, and by adhering to one source for a supply of plants; plants grown under different conditions should replace the old ones every few years. In Porto Rico fields have not been running long enough to test these points under our conditions, and the spread of the disease here is probably due to improper soils or faulty cultural methods.

Remedies.—The first precaution to be taken is one of prevention. Never plant a slip that could possibly be already diseased. Second, if the disease should appear, pull out all plants affected, burn them on the spot, or cover them with quicklime; also cover the soil with lime and leave it exposed to the sun for a few weeks, stirring it from time to time. After a month or six weeks strong, healthy plants may be reset in the vacant places. Third, keep the plants growing vigorously and the soil in the best possible physical condition.

SPIKE OR LONG LEAF.

Characteristics.—Any tendency to spike is quickly evidenced by the leaves becoming long and slender. As the disease progresses, the plant becomes more and more like a bundle of rod-like leaves. In the final stages the central leaves of the plant do not unfold, and thus in their long spike-like form give the name to the disease. A plant at all badly affected rarely produces any fruit; if any is formed it is small and practically valueless. Plants that are but slightly affected produce very poor, small-sized fruits.

Cause.—In most cases spike is apparently induced by improper fertilizing. Acid phosphate in the fertilizer is one of the most

common causes. Wood ashes and any poorly proportioned mineral fertilizer will cause it.

This disease is apparently readily transmitted, and suckers or slips from diseased parents should never be planted. Experiments have shown that fully 70 to 80 per cent of slips from sickly parent plants failed to produce marketable fruits.

Remedies.—First, never plant a slip that is in the least affected with the disease.

Second, for nitrogen and phosphorus fertilizers use tankage, dried blood, bone meal, or other organic forms. If necessary use acid phosphate, though results from it thus far are not definite.

Third, cultivate well and often, keeping the soil in the best possible physical condition and plants growing vigorously.

Aside from the above diseases there are several that appear locally, but thus far they have not proved dangerous. Their exact nature has not been fully determined, but they are being thoroughly investigated by the station pathologist.

LEAF SPOT.

The first of these local diseases of the pineapple, which we may call "leaf spot," has occurred quite frequently in many plantations, but only once has it threatened serious damage. It is a leaf disease characterized in the first stages by small brownish spots usually not more than one-eighth to one-fourth of an inch in diameter. They are regular in outline, but not of definite form. These spots rapidly increase in size, and as they spread the center loses all color as well as turgidity of the cells and becomes like straw-colored parchment. This colorless part is surrounded by a more or less clearly defined zone of brownish color, indicating the spread of the disease. In its spread the spots usually enlarge faster along the leaf veins, thus assuming a long oval shape. In many cases the edge of the leaf is affected, but any part may be attacked. In time the leaf succumbs and dies.

Cause.—The disease is not fully worked out, but its spread and development is undoubtedly aided by atmospheric conditions. During rainy periods, especially where drainage conditions are not the best, the development of the disease is quite rapid, but is checked by dry weather and culture.

Remedy.—Culture and fertilizing have been the most efficacious means of checking it. Plants kept growing thriftily do not feel its effects and soon grow out of it.

SUN SCALD.

Sun scald is not strictly a disease, but it is common and causes so much loss that it is well to consider it here. It is caused by the bending over of the plant so that one side of the fruit is exposed to the direct sun rays. Through moisture adhering to the fruit the action of the sun's rays produces premature ripening and scalding at this spot. Rot soon developes in this scalded part and the fruit is lost. This can be largely prevented by sending boys through the patch every week to put a small handful of dried grass upon every fruit that has fallen over.

TANGLEROOT.

Tangleroot is characterized by the roots winding round and round the stem instead of passing out into the surrounding ground.

Cause.—It is caused chiefly, if not entirely, by one of two things: hard soil, or the slip not having been stripped before planting. In our heavier clay soils the ground will often be allowed to become hard. As the young roots are tender and have not much penetrating power, they will follow the line of least resistance. The earth immediately about the stalk is less likely to be hard than that a little distance away; hence the roots follow around the stalk. Again, if the slip is not stripped before planting and the weather and soil conditions are such that the old leaves do not decay, the young developing roots must find their way out between the leaf and the stem, taking a circular direction, which results in tangleroot.

Remedy.—The cure is simple; keep the ground in good cultivation, and if conditions are not very favorable when planting, strip the plants.

BLACKHEART.

The disease called "blackheart" has not yet been reported in Porto Rico. It is due, apparently, to poor soil conditions and lack of proper food. It is characterized by the rotting of the heart of the pine before any sign of affection is shown on the outside. Any puncture or injury of the fruit will admit some of the many fungus spores that will produce rot. This will spread to the center, but it must not be confused with blackheart.

Remedy.—The cure, so far as known, is better culture and fertilizers. Phosphates and potash are usually the elements needed, especially the latter. Excess of nitrogen will produce soft fruits that easily succumb to all such troubles.

THE PHILIPPINE SCHOOL OF FORESTRY.

A NEW PROFESSION FOR FILIPINOS.

The Regents of the University of the Philippines have sanctioned a proposal by the Bureau of Forestry to inaugurate a course in forestry at the College of Agriculture in Los Baños, La Laguna Province. The Bureau of Forestry, inasmuch as it is entrusted with the management of one of our chief sources of public wealth, a forest property covering half the entire Archipelago, feels the urgent necessity of building up a force of Filipino rangers equipped with a technical knowledge of forestry, before lumbering on a large scale is permitted. If our forests can be explored, mapped, studied, and plans for their management drawn up and entrusted to scientifically trained forest assistants before lumbermen are allowed to work them up on a large scale, then there is no danger that the work of lumbermen in the Philippines will mean destruction to the forests as it has in the United States.

To attract the best of the young Filipinos who are just finishing their high school courses, the Bureau of Forestry has made an exceedingly fine offer to young men who are desirous of entering a profession in which the opportunity to make their services of great value to their people is second to none. The Director of Forestry and the Director of Civil Service have agreed that all Filipinos who complete the course now being given at the College of Agriculture will be appointed as rangers or head rangers without examination. The course planned at Los Baños is so comprehensive as to practically insure any graduate's ability to pass any technical examination which may be required for promotion. Rarely do boys in any land have positions opened to them which combine a relatively high initial salary and practically unlimited chances of promotion with healthy outdoor work which is so fundamentally vital to any people.

The forestry course at Los Baños is so arranged that boys who have completed the seventh grade can enter and graduate in four years. The first two years' work will be identical with the work of the agricultural students, including courses in Eng-

lish, mathemathics, botany, zoölogy, and entomology, all of which are necessary preliminaries to forestry.

The last two years will cover technical work in forestry surveying, physiography, and other auxiliary branches; probably half of the work will be practical field training; while during the spring vacations the whole class will go into camp in some forest where extensive lumbering is in progress. Students who have finished the second year high school work should be able to complete the forestry course in two years.

The course in forestry and the opportunity to enter the forest service is open to all Filipinos. No tuition will be charged, and living expenses are so small that twenty pesos monthly will amply cover the necessities of food, clothing, and books. No ambitious boy who is not afraid of hard work need hesitate for lack of funds, however, for there is sufficient work to be done on the school farm by which any boy can earn thirty centavos daily by three hours work. In addition, the Bureau of Forestry will appoint twenty pensionados this year who will receive ₱20 monthly in addition to quarters and transportation.

The importance of the good management of the colossal public wealth in our Philippine forests, the dependence of agriculture upon the wise handling of the water and cogon problems, the revenue that is possible from intensive forestry, all argue eloquently for a liberal and popular support of this institution the sole purpose of which is to train efficient public servants for the work.

CURRENT NOTES.

THE BATAC SCHOOL FARM.

According to a report of Mr. W. A. Wiren, Superintendent of the Batac School Farm, which is situated about one kilometer west of the town of Batac on the main provincial road and consists of about 6½ hectares of land adapted to growing any of the crops raised in that section, very successful work is being carried on in elementary agriculture.

About 80 boys have been working on the farm during the past year, 28 sixth grade and 52 fifth grade. The intermediate farming course has been followed, which gives each boy two and a fourth hours work, daily, on the farm. Each fifth grade student has a garden plot 2½ by 10 meters for which he is individually responsible. During the past year the students have been very successful in raising cabbage, lettuce, tomatoes, peppers, eggplants, beans, radishes, turnips, beets and collards. The following table will give some idea of the success of the students in this respect:

Cabbage	1,500 heads
Lettuce	280 dozen bunches
Tomatoes	850 plants
Eggplants	350 plants
Peppers	320 plants
Turnips	450 dozen
Radishes	520 dozen

In addition to this work the fifth grade boys have taken care of the school grounds, a flower garden, a number of mulberry trees and cleared about 1 hectare of land that was covered with bamboo and bushes. According to this report the work on the farm has been popular with the boys of the school and as a result many of them have home gardens. The sixth grade boys planted about 1½ hectares of rice of seven different varieties, which were carefully observed with reference to the time taken for each variety to mature, the amount produced, the quality of the grain, etc. They also put out and harvested

about 2 hectares of tobacco, 1 hectare of peanuts, 2 hectares of corn, and ½ hectare of grass.

Two crops were planted on over half of the farm, but some of these have not done well on account of lack of irrigation. There are now on the farm 500 mulberry trees, 150 of which are a year and a half old, the other 350 were planted during the past year. A silkworm house has been built and fitted out with everything necessary to care for the worms.

THE OPENING OF THE COLLEGE OF AGRICULTURE.

The College of Agriculture of the University of the Philippines began the school year 1910–11 with an enrollment of 90 pupils. One of the most encouraging features of the work of the school is that the enrollment this year included nearly all of the pupils who attended last year. The course of study laid down for the students includes a program for each school day beginning at 7 in the morning and continuing, with an intermission of one hour at noon, until 6 in the evening. The pupils in the college are at present divided into six classes and are studying twenty-four different subjects. While the college is very much handicapped by the lack of laboratories, workshops, farm machinery and apparatus, the work of the teachers and students is marked by a great deal of enthusiasm, which is doubtless owing to the zeal and energy of Dr. E. B. Copeland, the dean of the faculty.

It is understood that most of the students own their homes, which form a barrio on the farm. In this connection it should be noted that they learn domestic economy as well as farm management. The actual living expenses of students at the farm are from ₱8 to ₱10 per month, about half what it would cost them to live in Los Baños or Manila.

The faculty of the school consists of Dr. E. B. Copeland, who is dean of the college; Mr. Edgar M. Ledyard, assistant professor in entomology and zoölogy; Mr. Harold Cuzner, farm superintendent; Mr. S. B. Durham, who is in charge of the classes in animal husbandry; Mr. R. M. Holman, instructor in chemistry and botany, and Mrs. E. M. Ledyard, teacher of English, German and mathemathics. It is the intention of the faculty to give the students as much practical work as possible in connection with their studies, and excursions are made from time to time to keep them fully in touch and acquainted with the practical side of their work in the college.

On the farm there are upward of 1,200 mulberry trees and it

is expected that the silk house will be completed and in operation within the next five months. Various kinds of bananas are being grown to test their productiveness; three varieties of cassava and three kinds of sugar cane are being grown for the purpose of determining their adaptability to the soil of the farm, and many kinds of garden truck are being grown with success.

An important phase of the work in the college is that of economic entomology. This work deals with the insect enemies of farm plants, the means of eradicating or controlling them. It is understood that experiments are being made on the rice moth (*Spodotera Mauritia,* Boisd),[1] the corn moth (*Pyrausta vastatrix,* Schultze), the cucumber beetle (*Aulacophora coffeae,* Har.) and the orange tree scale (*Coccidae*). The mole cricket (*Curtillia africana,* Beaum.), white ants (*Termes gestrói*), the banana leaf roller (*Erionota thrax,* Linn.) and ylang-ylang moth (*Attacus ricini,* Boisd.) are also receiving the attention of the teachers and students at the college. Injurious insects are divided into two classes, those that eat the plants, and those that tap them and rob them of their juices. The students are taught the use of insecticides and fungicides such as Bordeaux mixture, and other preparations. No student will be allowed to graduate without fully qualifying in the use of these preparations for ridding farm crops of their common enemies.

A NEW RUBBER COMPANY IN BASILAN.

The Mindanao Herald states that Dr. J. W. Strong disposed of his rubber plantation on Basilan Island to a company composed of Manila capitalists. It is understood that a new survey has been made and some public land added to the original site, sufficient to increase the plantation to about 10,000 hectares. Doctor Strong retains an interest in the company and will act as superintendent of the plantation. There are now about 20,000 rubber trees on the estate, a large number of which have reached the tapping age and it is stated that by December about 40,000 trees will be ready to tap. Samples of the rubber from the Basilan plantation were sent to London sometime ago where they were examined by experts who declared them to be equal to the best Para rubber of Brazil. This plantation also contains about 75,000 hemp plants, several thousand coconut trees and a number of coffee plants. Mr. C. H. Cateaux of Manila is the head of the new company and it is understood that stock will be sold to the amount of ₱150,000.

[1] The following scientific determinations or classifications were made by the Bureau of Science.

FOREIGN CAPITAL FOR RUBBER GROWING IN THE PHILIPPINES.

According to The Manila Times of June 3d, Mr. C. A. Littler, who has recently succeeded in interesting British capital in the rubber-growing industry of the Philippines, together with Dr. Chas. B. Robinson of the Bureau of Science and Mr. Frank Bost, a rubber expert who will have charge of the company's plantation, left for Mindanao during the early part of June. It is understood that about ₱200,000 have been invested in this enterprise by an English and Scottish syndicate, half of which sum is available for immediate development work. The Insular Government is giving all assistance possible. One of the rangers of the Bureau of Forestry, who has been making investigations of the many rubber plantings in different parts of the Islands, accompanied the party on this trip. It was their intention to first visit several available sites near Zamboanga, then some land in the Cotabato Valley and later several Islands of the Jolo group.

PROVINCIAL NOTES.

Mountain Province (*Subprovinces of Lepanto, Bontoc and Kalinga*).—The people in this section produce practically nothing for export. Stock raising and the growing of crops for home consumption are, therefore, the two lines of agricultural work. Rice is grown in practically all parts, there being one or two exceptions where only camotes and corn are produced.

In the municipalities of Cervantes and Tagudin one crop of rice a year is raised while in the section north and east of Cervantes two crops are raised, one harvested in May and the other in November. The reason for this is that in Cervantes and Tagudin there is sufficient water for growing a rice crop only once a year, while in the other sections the mountains supply enough water throughout the year. The crops have been good in all places, with the exception of Tagudin, where last season was dry until a late period.

Camotes, beans and corn are grown quite extensively in most sections for home consumption along with the rice. The corn is the native variety, small and mixed yellow and white. Cacao is being planted among banana groves, which furnish protection against wind and there is a chance for it to become a marketable product if the local farmers will take hold of the work more vigorously.

Coffee.—It is well known that Lepanto coffee is one of the finest varieties of coffee to be had, and it is unfortunate that the last three years have been so disastrous to this industry through the destruction wrought by typhoons. Many small coffee ranches

have been neglected on this account. The average price for the best grade of coffee is at present ₱17 a cavan.

Bananas are to be seen everywhere and, in spite of typhoons, a sufficient supply can be had at most times, with exception of the months of October, November and December.

Potatoes (white) are usually scarce and bring a good price. They are grown by a few Igorrotes, high upon the mountains. I have distributed vegetable seeds at different times, so that American tomatoes, corn and radishes can occasionally be had. American onions do not seem to do well.

It is not to be expected that these people will take much interest in vegetables when there is no market for them, and when they do not care themselves for anything but rice, corn and camotes.

In Kalinga there is the finest opportunity I have seen in this country for extensive rice or corn growing, hundreds of acres with nothing but grass growing upon them. The soil is a black loam and there is a good supply of water. The inhabitants however, are content to live on corn and camotes. This applies to the Balanao country, as the mountain towns of Kalinga each have a sufficient supply of rice terraces.

This section will probably not be in a position to export any staple products any time in the near future unless it be coffee and cacao, and the development of these industries is seriously hindered by the frequent typhoons. (Report of C. B. Shoemaker, Veterinarian, July 1, 1910.)

Zambales.—The farmers were actively engaged in plowing and planting their rice land about the first of July. Previous to this time the dry season had been so marked that it was impossible to cultivate the soil and prepare the fields for planting.

The seed corn which was sent out by the Bureau of Agriculture was distributed by the provincial governor to the municipal councilors in packages of one kilo each, and through them to the leading farmers in different parts of the province. (Report of W. K. Howard, Veterinarian, Iba, Zambales.)

Marinduque, Tayabas.—Most of the lowland rice in Marinduque was harvested during the early part of May and a very satisfactory yield was realized. Notwithstanding the fact that a large part of the rice lands in Marinduque will produce two crops a year, there is, as near as can be estimated, between ₱80,000 and ₱90,000 worth of rice imported each year. In the municipality of Gasan a great deal of the rice land has been planted to coconuts. Considerable hemp and many coconuts are

being grown on the island, but these crops have not yet fully recovered from the baguio of December 5, 1908; it is claimed that the coconut groves are yielding little more than half the number of nuts they would normally yield, and the hemp fields in many places are still in bad condition. (Report of D. C. Kretzer, Veterinarian, Boac, Marinduque.)

Sorsogon.—The president of the municipality of Bacon, Sorsogon, forwards to this office a copy of Resolution No. 82 by the municipal council which has been approved by the provincial board. Following this resolution a meeting of the leading farmers and rice growers of the town was called for the purpose of discussing the labor conditions, also the methods of planting and cultivating rice in that section. A large number of the farmers of this municipality responded and an interesting and enthusiastic meeting was held at which the following resolutions were passed:

(1) That every year, beginning with the first week of October, all farmers will repair their trenches for furnishing water to the rice fields, that all of the farmers shall coöperate in repairing their trenches, being careful not to interfere with the rights of anyone.

(2) That the work of preparing the seed beds will be done during the month of October of each year and the transplanting of rice to the fields will begin on the first day of November and continue to the end of December of each year.

(3) That after harvesting the highland rice the fields shall be prepared and planted with corn, sweet potatoes (camotes), mongos and such crops as will increase the fertility of the land for growing the next rice crop.

To say the least, the meeting and the resolutions passed by the farmers in Bacon show a decided interest and a desire to improve the present methods of growing rice in that section. Bacon has a large acreage of rich agricultural land which has the very best natural facilities for furnishing water to the rice crop.

Capiz.—The last reports received from Capiz Province, show that the province is free from rinderpest and other infectious animal diseases. Considerable enthusiasm is being manifested by some of the farmers in the Panay river valley. A number of farmers in the province are turning their attention to tobacco growing. In Buruanga the farmers are making many inquiries regarding the tobacco bounties and even the schools have expressed a desire to compete for the prizes which will be awarded

this year. Some attention has been given to school gardens in this province and where the work has been successful considerable interest has been manifested on the part of the farmers.

Iloilo.—Practically all of the crops growing at this season are doing very well. A great deal of land is being planted to sugar cane, but much of it was planted so late that it is still very small and in most parts of the province the rainfall had been so light that the sugar cane has not grown very rapidly.

A great deal of attention is being given to tobacco growing and in some municipalities, more especially Santa Barbara, Jaro, Leon and Passi, a great deal of tobacco has been planted. Many of the farmers are studying the conditions under which the tobacco bounties are to be awarded and it is expected that there will be a very enthusiastic competition for the prizes which will be awarded when the present crop is harvested.

Considerable corn has been planted in the southern part of the province, in fact the area planted to corn has considerably increased over that of last year and the prospects for the present crop are excellent, notwithstanding the long dry season. (Report of J. A. Thompson, Veterinarian, Iloilo.)

Occidental Negros.—The rainfall during the month of June was very light. The farmers were busy cultivating the corn crop, which was growing well. Locusts have been reported in different parts of the province but few of the farmers have made much of an effort to destroy them. Frequent reports of locusts appearing in different parts of Occidental Negros and Panay have been received, and it is feared that unless the provincial and municipal officials coöperate with the farmers a great deal of damage will be done to crops during the present season. (Report of W. A. Mace, Agricultural Inspector, Hinigaran, Occidental Negros.)

Oriental Negros.—Agricultural conditions have been improving in Oriental Negros. The rainy season began earlier in some parts of this province than in most places, in fact so early that farmers were overtaken by the rains while planting their corn. The "Mexican June" corn which was sent to the province by the Bureau of Agriculture was quite widely distributed and has been planted by a number of farmers in different parts of the province. (Report of B. J. Eno, Veterinarian, Dumaguete, Oriental Negros.)

NOTES FROM OTHER FIELDS.

THE PORTO RICAN PINEAPPLE INDUSTRY.

Special Agent John M. Turner, who has been stationed at San Juan, Porto Rico, states in the Consular and Trade Reports for June that pineapple culture in that island affords large and quick returns to investors, which many have been wise enough to see and turn to advantage. We have been publishing in the REVIEW for the past few months an account of the cultivation of pineapples as it is practiced in Porto Rico, and this information regarding the industry in general may prove of interest.

The native pineapple, "Pan de Asucre," is said to be too delicate for shipping purposes, and the "Smooth Ceyenne" has also proved unsatisfactory in this regard, so the "Red Spanish" and the "Cabezona" varieties are the principal ones under cultivation at the present time. The "Red Spanish" is being propagated more extensively, since it is hardy, offers the largest yield, has the best flavor, and the fruit is of inviting size to the average buyer. The "Cabezona" yields a very large fruit, which sells as a rule for about $0.50 (₱1.00) in the United States markets. These fruits have to be so carefully handled to prevent bruising that the production is very expensive. However, the returns are correspondingly large, and it is stated that the net profit from an acre of "Cabezonas" in a good year is not less than $1,600 (₱3,200). But as the smaller and consequently less expensive fruit has a wider sale in the markets, it is more generally raised.

The area under pineapple cultivation at present exceeds 2,000 acres (809.4 hectares), and is increasing so rapidly that it is expected to soon exceed 10,000 acres. Mr. Turner says that many of the insular government employees have been attracted to pineapple cultivation by the large returns, and that in a number of cases these investments have proved so much more profitable than their official positions that they have abandoned the latter and devoted themselves wholly to agriculture.

The Porto Rico Horticultural Association has been formed by the fruit growers, and is proving very helpful. This association exists solely for the good of the fruit-growing industry, is

organized on broad lines, has no land or property for sale, and serves the purpose of a bureau of information. At present it is encouraging the establishment of canneries in the pineapple districts, as the necessity for them is growing. Thus far the market for the green fruit has been so good in the United States that canneries have not been essential, but as the industry grows there will be more and more fruit to be disposed of in this way.

Figures showing the expenses and returns received per acre in different pineapple districts of the island are given by Mr. Turner, from which we have taken the following, as showing about the average (these are from the Laguna district, near San Juan):

Expenses—One acre of land, $125; clearing and preparing, $30; 10,000 slips cost, $40; planting same, $15; cultivation to crop, $30; fertilizer, one ton, $45; pick, pack, etc., 300 crates, $24; paper, crates, nails, etc., $60; transport to steamer, $30; freight to New York, $93; total $492.

Returns—300 crates, at $1.60, $480; 18,000 slips, at $3, $54; value of plants in ground, $45; value of acre of land, $150; total, $729; leaving a credit balance of $237.

COCONUT DISEASES IN JAMAICA.

The Journal of the Jamaica Agricultural Society for May (Vol. XIV, No. 5) contains a contribution by Mr. Leo A. Wates, an Agricultural Instructor, regarding the prevalence of disease among the coconut groves in Jamaica with suggestions for dealing with the various difficulties. It is stated that so many of the groves are affected that the planters are becoming alarmed for the future of the industry. Mr. Wates, who has evidently investigated the pests and diseases of coconuts very carefully, offers the following suggestions for dealing with trees that have been attacked:

(1) It is absolutely necessary in bearing coconut fields to keep the root of the tree free from husks, fallen limbs, etc. I am certain that these allowed to collect at the roots of the trees, as is generally the custom, harbor the trunk borers, and very likely start the fungus disease of the root. This latter, by the way, I can not find affects the roots themselves, which always appear normal and healthy in the sickest looking trees. May it not be a fungus disease of the trunk starting under the overhanging crown of the tree covered by the mass of rubbish nearly always left round the trees?

(2) For borer of the trunk, tar, if the tree is taken early, is a sure cure.

(3) This means at least quarterly inspection of all the trees for signs of the trunk borer, by red water.

(4) Regular spraying of the young trees with Bordeaux mixture, say once in six months, to keep off the attacks of the beetle borers at heart. (I hope I have made this clear to be a separate beetle from the trunk borer). In reference to this some planters have said it is such a large expense, etc. * * * I have, however, made a thorough experiment with this, and am in a position to say that 200 gallons (756 liters) of Bordeaux

mixture sprayed in my walk 181 trees of a bearing age, say ten years of age, at a cost of (including labor) 1*d* per tree (₱0.04 in Philippine currency) with a little bucket spray pump. Young trees, such as the beetle usually attacks, can be sprayed for ¼*d* per tree. Mostly it will be worth while on a place with say 25,000 trees, expected to yield in ten years' time, at least £2,500 (₱24,250) per annum, to expend the sum of £50 (₱485) per annum for ten years, especially as without any doubt by results seen here, I am certain the crop is largely increased at the bearing stage by spraying.

(5) Careful examination of trees regularly at three-month intervals for signs of the rot disease (a red gum exuding). If seen, at once excise the part, so that not a sign of the diseased tissue is left, and tar the place. My experience has proved this successful, and I am now trying it on a larger scale. It positively stops the disease for a time; if altogether, remains to be seen. Unless cut entirely out, the disease will return. * * *

(6) The total destruction of all trees gone too far, even though they have still a few nuts on, by cutting down and burning.

(7) Burning, i. e., setting fire to the strainer of all trees that are unthrifty in appearance and not yet bearing. The resulting growth and improvement of these trees after recovering from the shock (12 months) has been surprising.

(8) The disinfecting of every seed nut by dipping it in a bath of Bordeaux mixture before planting.

(9) The very strictest attention to preventing the cutting of trees or the sticking of cutlass points into the trunk. I find that it nearly always sets up a rot and a running of red water. This only affects trees quite soft in the bark. If cut, tar the places.

RUBBER CULTIVATION IN JAVA AND SUMATRA.

Some interesting comments on the agricultural methods, etc., in use in Java and Sumatra, particularly with regard to rubber, are published in the Tropical Agriculturist for May, 1910. M. Leplae, the Belgian Director General of Agriculture for the Congo, has recently made a trip through the East for the purpose of studying the various methods of rubber cultivation in practice in the rubber-producing countries, and his account of conditions in Java and Sumatra will probably prove suggestive to Philippine planters.

M. Leplae found that *Ficus elastica* was in great favor in these islands, which he thought was a mistake, as after what he had seen in the Federated Malay States *Hevea Braziliensis* seemed far superior. He estimated that there were as many as 200,000 to 300,000 acres (80,000 to 120,000 hectares) under rubber cultivation in Java and Sumatra.

On one estate in Sumatra M. Leplae observed that 2,600 acres (1,040 hectares) of rubber were set out in clay soil. The trees were doing fairly well, and interesting experiments in the use of nitrogen manure were being conducted. "The application seemed to be doing a great deal of good, for trees a year and a half old were as large as trees three years old on the same soil,

but to which the manure had not been applied. Something like half a pound of guano per tree was used to start the growth in the cold, clay soil." If the trees started well they grew very well indeed, but if they did not start properly the growth appeared to be very slow.

Clean weeding he found practiced on all the plantations, and green manures were not used. Small plants were sometimes placed on hillsides to prevent washing of the soil, but these were usually *Passiflora.* "Trees growing on estates that were not clean weeded could not be compared in size with the others." The distance for planting rubber was usually about 20 feet, and the trees were planted in squares. Diseases were being kept down very successfully. White ants had been found to inhabit stumps and trunks left in the ground, so all such obstacles were being removed, and that difficulty overcome. It was noticed that trees growing on low, swampy and peaty soil did extremely well, but did not yield much rubber.

As for tapping, M. Leplae stated that 5/16-inch gouges were in almost universal use, and gave very good results. He was much interested in the experiments of Mr. Gallagher, Malay State Mycologist, which tended to show that the best method of tapping was the one by which one quarter only of the tree was tapped. The results were good and tapping could be done every day. The yield was estimated at 160 to 200 pounds an acre (177 to 222 kilos per hectare) at six years of age, and 500 pounds (556 kilos) at ten years.

THE FIBER MARKET.

Compiled by M. M. SALEEBY,
Fiber Expert.

The following data on the New York fiber market is taken from Smith & Schipper's Monthly Report dated New York, June 1, 1910.

MANILA.

We have experienced a very dull market during the month, and the amount of shipment business has been next to nothing. There has been so much uncertainty about the receipts at Manila that buyers have refrained from operating, a great many holding the opinion that the production at present is in excess of the consumption. The receipts are certainly on the full side and we are already 56,000 bales ahead of last year. The dealers at present receive $1.75[1] per bale for province-packed parcels, but owing to the poor classification of this province hemp they are to receive $1 per bale when the hemp is properly classified, and only 50 cents when it is not properly classified. The anxiety of the dealers to get the full $1.75 under the old arrangement may have caused them to ransack their warehouses for all baled hemp, so as to get it into Manila in time. This influx of hemp into Manila has quite naturally weakened the market with the result that Fair Current has dropped $5\frac{3}{8}$ to $5\frac{3}{4}$ cents. There seems to be enough demand from the shippers in Manila to maintain that market on a fairly steady basis, and no very low prices have been named here. Low prices have been quoted in London, but it must be remembered that the London Standard of Fair Current is lower than New York.

Spot Hemp has ruled steady except in the case of the lower grades which have been offered at under shipment values. Quite a fair business has been done in good hemp at fair prices, all for account of second hands.

[1] $1 equals ₱2 Philippine currency.

Quotations.

	August to Sept.	July to August.	June to July.	May to June.	Afloat U. S.	Spot U. S.
F. E. A. quality	9¾	9¾	9¾	9¾	9¾	9¾
Superior good current	9¼	9¼	9¼	9¼	9¼	9¼
50 per cent over good current	8¾	8¾	8¾	8¾	8¾	9
Good current	8⅜	8⅜	8⅜	8⅜	8⅛	8⅛
75 per cent over fair current	8	8	8	8	8⅛	8¼
Midway hemp	7⅛	7⅛	7⅛	7⅛	7⅝	7¾
25 per cent over fair current	6¼	6¼	6¼	6¼	6⅜	6⅛
Fair current	5¾	5¾	5¾	5¾	5¾	6
Superior seconds	5⅜	5⅜	5⅜	5⅜	5⅛	5¾

SISAL.

This market has dropped another quarter of a cent, and business has been done at 5½ cents for White, and 4⅞ cents for Red, at which prices there are further sellers. The uncertainty in sisal has had a great deal to do with the lack of demand for Manila. Some buyers have entertained the opinion that this market will go still lower, but there is a good demand in the Mexican market at an equivalent of 5½ cents New York, so for the present lower prices are unlikely.

MAGUEY FIBER.

Quiet at 4½ for No. 2 and 4¾ to 4⅞ cents for No. 1, but the demand is limited.

NOTES ON MANILA MARKETS FOR JUNE.

By KER & COMPANY.

Based on advices

From—	Date.	From—	Date.
San Francisco	May 25	Hongkong	June 24
London	June 3	Cebu	June 25
Singapore	June 10	Iloilo	June 28

SUGAR.

Manila.—No transactions, crop practically over.

Iloilo.—Some considerable transactions have taken place since our last report in consequence of which, and owing to better advices from the United States, the market closes firm with upward tendency; holders are unwilling to sell except at a considerable advance. We quote buyers, no sellers, 50 per cent Nos. 1 and 2 mixed ₱8.25 per picul [1] bases assorted.

Cebu.—Nothing new; the market remains the same as for past two weeks.

HEMP.

There has been little change in the market, all parcels on offer find buyers at about former rates. Market closes quiet, with buyers of Albay Current at ₱9.25 per picul. Receipts at all ports for the six months were (subject to adjustment) 670,169 bales, compared with 629,838 bales for the corresponding period of last year, and 478,345 bales for 1908.

COPRA.

The market remains in a quiet state. There are buyers of fair merchantable quality at ₱10.37½ per picul. Cebu fair merchantable sundried is not in demand.

Comparative statement of total exports for first six months of 1908, 1909, and 1910.

	1908	1909	1910
Dry sugar ..... tons..	81,932	68,475	67,960
Hemp ..... bales..	376,610	568,811	595,513
Copra ..... piculs..	396,307	647,227	738,021
Cigars ..... millions..	45,725	54,490	96,695

[1] 1 picul equals 63¼ kilograms.

THE ILOILO SUGAR MARKET.

By JOSE T. FIGUERAS.

JUNE.

The sugar received in Iloilo from the sugar mills during the month of June amounted to 133,890 piculs.

The quotation at the close of May of 8 pesos and 1 real[1] continued until June 7 when 8 pesos and 2 reales were offered. On the 15th the price dropped to 8 pesos and 1 real, and again on the 18th it dropped to 8 pesos which was quoted until the 28th when 8 pesos and 1 real was offered; this quotation continued until the close of June.

June shipments.

Date.	Vessel.	Destination.	Superior.	Wet.
			Piculs.	*Piculs.*
June 1	Frankby	United States	83,200	
June 26	Shimosa	New York	80,000	
Total for June			163,200	

Exports up to June 26, 1910.

To—	1908–9 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	235,600		588,000	
Japan	8,000	8,915		
China	588,923		64,575	486
Total	832,523	8,915	652,575	486

[1] 1 real equals 12½ centavos.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

JUNE, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	3,240,004	5,188,004	1,017,758	159,467	76,121			9,681,354
	Value	Dollars	106,457	169,100	30,022	6,166	2,834			314,579
Beef cattle	Quantity	Numbers	1,847	40			5			1,892
	Value	Dollars	46,427	895			71			47,393
Sugar	Quantity	Kilos	236,964	52,918	26,446	5,707	4,293			326,328
	Value	Dollars	16,501	3,641	1,908	451	323			22,824
Coffee	Quantity	Kilos	69,895	3,931	5,822	464	3,125			83,237
	Value	Dollars	17,008	863	1,216	121	762			19,970
Cacao	Quantity	Kilos	61,679	8,752						70,431
	Value	Dollars	15,960	2,347						18,307
Eggs	Quantity	Kilos	246,747		377		383			247,507
	Value	Dollars	24,327		18		13			24,358
Raw cotton	Quantity	Kilos	48,096							48,096
	Value	Dollars	17,331							17,331

EXPORTS.

Hemp	Quantity	Kilos	12,072,397	4,729,615		7,529	1,060			16,810,601
	Value	Dollars	1,230,595	515,415		654	300			1,746,964
Sugar	Quantity	Kilos	3,534,170		10,480,478	720				14,015,368
	Value	Dollars	171,917		727,120	54				899,091
Copra	Quantity	Kilos	5,172,504	1,460,124	202,400	138,202	231,830			7,205,060
	Value	Dollars	424,169	127,921	19,600	11,264	20,754			603,708
Cigars	Quantity	Thousand	20,194							20,194
	Value	Dollars	295,848							295,848
Cigarettes	Quantity	Thousand	1,810							1,810
	Value	Dollars	2,114							2,114
Tobacco	Quantity	Kilos	555,967							555,967
	Value	Dollars	74,608							74,608

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

JUNE, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.8	------	28.1	0.8	27.0	0.3	29.2	------	26.0	36.0	28.0	------
2	28.6	------	27.9	6.3	28.6	------	29.4	16.8	26.8	------	28.2	1.5
3	28.8	------	27.4	------	28.2	42.2	29.4	16.8	27.4	------	28.6	------
4	28.0	2.5	27.9	2.8	27.6	------	29.0	------	28.2	------	29.4	------
5	28.5	------	27.5	3.8	28.8	------	28.5	------	28.6	------	(1)	------
6	28.1	12.2	28.1	------	28.4	------	29.2	------	28.9	------	------	------
7	23.4	------	27.8	34.0	28.3	------	29.5	0.8	28.8	------	------	------
8	28.4	------	25.9	1.3	27.3	------	29.8	------	28.3	------	------	------
9	28.7	1.0	27.8	------	28.5	------	29.4	0.5	28.6	------	------	------
10	28.7	19.3	27.8	------	28.6	------	29.7	------	28.6	------	------	------
11	27.0	6.9	26.0	5.6	27.4	5.8	29.6	------	28.3	------	------	------
12	28.4	5.1	27.3	3.1	28.1	------	28.9	------	28.2	------	------	------
13	27.7	9.3	27.4	4.6	28.1	------	29.3	------	28.4	------	------	------
14	28.2	------	25.8	6.0	28.9	10.7	29.6	------	29.0	------	28.6	------
15	28.4	11.7	26.8	9.6	28.6	1.3	30.2	------	29.4	------	29.2	------
16	27.9	25.6	27.6	------	28.6	------	29.3	------	29.3	------	29.2	------
17	28.8	------	25.6	2.0	28.2	------	29.2	------	28.6	------	29.4	------
18	28.0	15.2	26.9	16.0	28.8	------	29.1	------	28.4	1.0	27.9	------
19	28.1	0.3	27.0	0.5	25.8	14.0	28.9	------	28.6	------	29.2	------
20	27.0	13.8	26.5	8.4	26.4	0.3	29.2	1.8	27.8	------	27.9	------
21	27.5	1.5	25.8	17.5	26.8	5.8	29.1	------	27.8	4.1	28.0	------
22	26.8	47.0	26.6	12.2	27.3	2.8	28.1	------	28.6	------	27.8	------
23	26.3	20.9	26.0	0.3	26.6	10.9	27.6	------	28.2	------	28.6	33.0
24	27.2	8.3	26.3	8.1	26.1	0.3	29.5	4.6	28.2	------	28.2	------
25	27.2	------	26.2	------	26.3	0.3	28.2	------	28.3	------	28.2	2.3
26	25.8	7.6	25.8	17.8	26.0	1.8	29.4	52.1	27.6	8.4	27.6	------
27	26.8	3.0	26.9	36.1	26.6	8.6	25.3	6.1	25.6	69.0	26.0	------
28	25.6	3.0	26.9	------	26.5	3.0	26.8	3.6	26.2	0.8	28.4	------
29	26.5	------	26.1	2.8	26.3	1.0	28.0	2.0	28.6	------	29.0	------
30	26.8	------	27.1	------	26.0	1.3	27.8	2.8	28.1	------	29.3	------

[1] No observation was taken in this station from the 5th to the 13th, the observer having been sick during these days.

CURRENT PERIODICAL LITERATURE.

ARTICLES IN CURRENT PERIODICALS, ETC., THAT MAY BE OF INTEREST TO AGRICULTURISTS IN THE PHILIPPINES.

SUGAR.

World's Sugar Crop for 1909–1910, by Consul-General Henry W. Diederich, of Antwerp, in *Consular and Trade Reports,* April, 1910, No. 355. A statistical review (with tables) of the sugar production of the world for the current and previous seasons.

Producción de Azúcar en Filipinas, por Thur Smith, in La Hacienda, Volume V, No. 9, Junio, 1910. A translation of the series of articles recently published in the *"Louisiana Planter."*

Sugar Cane in Porto Rico, by D. W. May, published as Bulletin No. 9, United States Agricultural Experiment Station, Mayaguez, Porto Rico. In *Porto Rico Horticultural News,* Volume III, No. 5, May, 1910 (to be continued).

Sugar Consumption in the Orient. From the *Louisiana Planter,* volume 44, No. 10, March 5, 1910. Reprinted in Tropical Agriculturist for May, 1910, volume 34, No. 10. Increasing importance of the Orient as a sugar consumer.

RUBBER.

Modern Rubber Machinery (no author is given), in *Tropical Life,* Volume VI, No. 4, April, 1910. Beginning a series of articles on rubber machinery for both plantation and wild rubber. Well illustrated.

Composition of the Latex of Some Rubber Trees. (Copied from *Agricultural Bulletin of Straits Settlements and Federated Malay States,* February, 1910) Agricultural News, April 16, 1910, Volume IX, No. 208. Analytical notes of rubber plants that are growing in the Botanical Gardens, Singapore, the plants being Para, Ceara, and Landolphia Hendelotii (a West African rubber vine).

(1) Tapping Rubber Trees, (2) A New Substitute for Rubber, (3) Rubber from the Banana, and (4) Rubber Notes. Four brief articles published under the title "Tropical Industries," in *Queensland Agricultural Journal,* volume 24, No. 6, June, 1910.

MISCELLANEOUS.

Some Methods for the Destruction of Noxious Insects and Rats. Translated from *L'Agronomie Tropicale,* Brussels. In *Queensland Agricultural Journal,* volume 24, part 6, June, 1910. Brief instructions and formulæ for destroying pests.

Friendly Insects, By Walter Frogatt, Government Entomologist, in *Agricultural Gazette of New South Wales,* April, 1910. A detailed and well illustrated account of the friendly insects of general occurrence.

Legislation in the West Indies for the control of Pests and Diseases of Imported plants, by H. A. Ballou, in *West Indian Bulletin,* Volume X, No. 3, 1910. Quotations from laws and proclamations on this subject in force in the British Indies.

Coffee Cultivation in Queensland, By H. Newport, Instructor in Tropical Agriculture, in *Queensland Agricultural Journal,* volume 24, No. 6, June, 1910. Beginning a series of papers on this subject. The opening article discusses briefly the question of shade, catch crops, and manuring.

Experiments on the Fertilization of Tobacco, by Paul Wagner. Bulletin No. 138. *Researches of the German Agricultural Society.* Scientific investigations and experiments to determine the influence of manuring on quality, and discussion of the results obtained.

PLATE I.—VIEW OF LIBERIAN COFFEE GROWING AT AGRICULTURAL EXPERIMENT STATION, LAMAO, BATAAN PROVINCE.

THE PHILIPPINE

Agricultural Review

VOL. III SEPTEMBER, 1910 No. 9

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EDITORIAL.

CONTAGIOUS PLEURO-PNEUMONIA.

We are printing in this number of the REVIEW an article on pleuro-pneumonia by Dr. A. R. Ward, Chief Veterinarian of the Bureau of Agriculture, who only recently arrived in the Philippines. This disease was discovered July 14 in a herd of cattle which had been imported into Manila from Australia. His first work was to meet this emergency and make plans to prevent the

spread of the disease. A part of those plans are set forth in General Order No. 16, which was promptly put into effect to prevent a possibility of further introducing this disease. All of the Australian cattle from the infected port have been closely quarantined and ordered slaughtered with the least possible delay so as to destroy any further infection that may exist among them. The decided action taken in this matter shows that the policy of the Government for the exclusion of diseased animals is to be strictly followed, even though it cut off such a fine supply of cattle as those which were coming in from Australia.

The cattle importers and dealers, and other interested parties in Manila, have strongly opposed the measures adopted, have sought to continue the importation by agreeing to quarantine and slaughter the animals on board lighters anchored in the bay, and otherwise comply with reasonable restrictions designed to prevent the introduction of the disease. This plan, however, seems impracticable unless the same privilege be granted to all importers for cattle coming from all ports infected with all of the diseases against which this Government is waging a campaign of extermination. This would naturally result in turning a tide of diseased cattle in the direction of Manila Bay from all parts of the Orient, and would render the importation of healthy animals impracticable. It does not seem probable that such a course will be permitted after the great advance made during the past year in reducing the prevalence of the infectious diseases of live stock.

GENERAL INTEREST IN SUGAR.

If anyone doubts that there is widespread interest being manifested at the present time in sugar production in the Philippine Islands, he should go into the provinces where sugar is being grown, to the markets where it is being sold, and to the money centers from which it is being financed. Scarcely a day passes that some letter of inquiry does not reach the Bureau of Agriculture, or some caller drop in, for information on the sugar industry. The native planter, who has learned by long years of successful sugar growing that this crop is the best money producer in the Philippines, is quietly purchasing additional draft animals, breaking land, and extending his area planted to cane. Most of these planters except to secure advances on the growing crop in time to put in additional milling facilities for handling the increased area. The planters in one enterprising community in Pampanga Province conferred together and decided that they

would float a central milling company, which should erect and operate a modern mill in that vicinity. Plans were drawn, a prospectus issued, and enthusiasm ran high for some time. It is a matter for regret that sufficient money could not be obtained locally to finance this enterprise, and other plans must be adopted for getting the required capital.

Sugar growing in the Philippines has far outstripped the methods of milling. With the present methods the Islands suffer each year an enormous loss by poor extraction, which results in a large percentage of the sugar produced on the farms being used as fuel for evaporating the remaining juice extracted by the small mills. Open-kettle evaporation is used exclusively, and at best produces only a fair grade of muscovado sugar. During the past year there was a noticeable tendency to abandon the production of this "pilone" type of sugar in favor of the lower grade Iloilo sugar, which refiners have found highly unsatisfactory.

The first need of the industry is a series of good central mills in all of the principal sugar districts which will take the cane directly from the fields on suitable tramways and pay the grower a satisfactory price for it, either in cash per ton of cane delivered, or a part of the sugar produced. American and foreign capitalists may be able to buy large tracts of land, build mills, and successfully develop in new territory the growing and manufacture of sugar in these Islands, but the first demand is for the necessary facilities for properly milling the cane that is now being grown by the Filipino planters.

AMERICANS IN THE PHILIPPINES.

The American is proud of his country and of all that goes with it. When he goes to another land, and sees things that are different from those at home, he longs for the surroundings of his boyhood and never loses an opportunity to impress his auditors with the superiority of things American. This trait is a peculiar expression of patriotism, which is highly commendable from an American standpoint, but not always wise in its application to his immediate surroundings.

There appears to be another trait of character which is very noticeable in Americans who come to the Philippines. They all seem to be "natural-born farmers," and the majority of them seek to plant something, if it is only a small flower or shrub. They often spend much time and money in collecting plants and

seeds which they take to remote stations throughout the Islands, plant, and care for with the greatest zeal, but often, unfortunately, fail to produce anything of value. The repeated failures they experience is not due to lack of knowledge of the crops which they plant, to want of industry and enthusiasm on their part, or to the proper care of the plants, but is due primarily to the fact that they almost invariably want to plant those things with which they are familiar, and which ordinarily grow only in temperate climates. This is true of standard field crops, vegetables, flowers, and ornamental plants. Most of these Americans have but little time during their limited stay in the Philippines to devote to the study of agriculture, and, as they do not succeed with the things they know, they do not seek to produce the crops with which they are not familiar.

The principal cause of these failures is the great difference between conditions in the Philippines and those in the greater portion of the United States. These Islands are strictly tropical, have an extreme dry and rainy season, and the soils vary widely in types. Small seeds planted directly in the ground readily become the prey of ants, which rapidly destroy any seeds during the germinating period when the starch is being converted into sugar, thereby giving them a sweet taste. They readily destroy tobacco, corn, peanuts, flower and vegetable seeds. If the seeds chance to escape the ants, it often happens that they are planted in the middle of the dry season when there is not enough moisture in the ground to cause them to germinate, or it may happen that they are planted in the middle of the rainy season, when life for the young plant would be impossible even if the seeds escaped the ants and germinated. Plants that are successfully germinated from seed or transplanted are often placed on land in which the conditions are prohibitive for their successful growth. Many Americans in the Philippines have the impression that the lands here are very rich, because of their dark color. As the average rainfall here is about 3,800 millimeters (150 inches), most soils are badly leached during the rainy season, and the best black volcanic soils are often actually poor in plant food throughout the year. Lands which have been allowed to grow up in cogon and other noxious grasses, and weeds, are usually so depleted in fertilizing ingredients that they do not produce good crops for a year or so after being broken up.

Those who wish to engage in agricultural pursuits in these Islands should realize that they are working under conditions varying greatly from those to which they have been accustomed in the United States, that the crops grown here are of a tropical

nature, and that these crops should be cultivated along the lines indicated by the many years of experience which have led to their successful production by the native people.

There are local forest and field crops in abundance in these Islands, the cultivation of which will yield ample profits. There is a variety of native vegetables sufficient to supply the most exacting table, and native fruits may be produced in abundance everywhere. To the American who wants to farm in the Philippines, we commend the study of native and tropical crops rather than costly experiments with those of temperate climates.

IMPROVEMENT OF AGRICULTURAL CONDITIONS.

The improvement of agricultural conditions in the Philippine Islands is a subject of widespread interest and endless discussion. To one familiar with the mighty strides that have been made in American agriculture during the past few decades, it sometimes appears that agricultural development in the Philippines proceeds slowly, or not at all. In general, however, the more pessimistic observers are those least familiar with local conditions. The person who thoroughly knows and understands existing conditions in these Islands appreciates the fact that agricultural progress must be slow.

In speaking of agricultural progress in this connection we refer to such progress as is being made, and can be made by that great body of small farmers who carry on the bulk of Philippine agriculture. The occasional wealthy "hacendero" and the farmers who come to these Islands from other countries provided with both capital and knowledge of modern agricultural methods can find no richer field for immediate and rapid development. In thinking of the general progress of agriculture throughout the country, however, we must consider the average farmer, and the average farmer in the Philippines is neither wealthy nor is he equipped with any knowledge of modern agriculture.

The agriculture of this country is largely in the hands of small holders, who are, as a rule, conservative, poor, and inclined to be nonprogressive. The most difficult problem in connection with agricultural progress in the Philippines is to effectively reach this class of farmers.

In the present number of the REVIEW we are publishing an article on "The introduction of improvements into India agriculture," written by the principal of the agricultural college at Poona, Bombay. Except for the rigid separation that exists

between different classes of society in India, because of caste, conditions relating to agricultural development in that country are, in many respects, similar to those found in the Philippines.

In this article Doctor Mann states that a careful study of local conditions is the first step in the introduction of any improvements, and that the second step is to secure the confidence of the people. When the requirements and desires of the people are thoroughly understood, and their confidence is won, the introduction of improvements can be attempted with reasonable prospects of success.

CONTAGIOUS PLEURO-PNEUMONIA IN CATTLE.

By Dr. ARCHIBALD R. WARD,
Chief Veterinarian.

Contagious pleuro-pneumonia is, next to rinderpest, the most dangerous bovine disease. Europe is the source from which it has spread during modern times and some few districts are still infected. In one region in Holland 600,000 head of cattle died in ten years. In England, in 1860, 200,000 head died from the disease in one year and during a period of six years about 1,000,000 head became victims.

South Africa became infected in 1854 and continues to harbor the disease. It was introduced into Australia in 1859 and, during th years 1860 to 1862, 1,500,000 head became infected. About 1894 the annual losses in the single State of Queensland amounted to ₱6,208,000.

The United States became infected in 1843 by one cow imported into Brooklyn by a dairyman. From this center infection spread to eleven States. No effort to exterminate the disease commensurate with the demands of the task was made until 1887. After five years of work and the expenditure of ₱3,018,000 the disease was eradicated. In 1847 one herd became infected in New Jersey by a fresh importation of the disease, which was checked by the owner at a cost of ₱20,000. Another importation in 1859 spread infection around Boston. This was stamped out by the slaughter of 1,164 head at a cost of ₱155,000.

Since 1892 the United States has been free from infection. This result was accomplished by placing infected areas in quarantine, discovering centers of infection by inspection, slaughtering infected animals and those exposed to them with compensation to the owner. In order to preserve these good results unimpaired, the United States has maintained a three months' quarantine against countries from which the infection might be introduced, and in addition observes for three months more such cattle as have been passed through quarantine. The experience

of the United States with pleuro-pneumonia furnished ample justification for the employment of radical measures in excluding and exterminating animal plagues of foreign origin.

Circumstances at present do not warrant devoting space to a discussion of the symptoms or changes in the lungs noted after death. It is hoped that the necessity for bringing these facts to the notice of stockmen in the Philippine Islands will never arise. It should be observed, however, that the disease may develop very slowly and that it attacks only a few animals at a time as compared with other epizoötic diseases. Three months may elapse between the exposure to infection and the appearance of the symptoms. The symptoms may be obscure and the most certain way to recognize the disease is by an examination after death.

The shipment to Manila of Australian range cattle from the port of Wyndham, in West Australia, was followed by the recognition of contagious pleuro-pneumonia among them on July 14. Immediately a cablegram was sent to the American consul at Sydney, with a request that he ascertain and report the States and ports of the Australian Commonwealth which were infected with cattle pleuro-pneumonia. His reply was that sporadic cases of pleuro-pneumonia existed in all of the States of Australia, except Tasmania, but that the disease was not epizoötic. He also stated that he would mail a report, which has not been received at this writing. The circumstances mentioned in the cablegram regarding the occurrence of sporadic cases and the absence of an epizoötic are of no significance, for such conditions are to be expected with this disease on a continent that has been infected for half a century.

The appearance of the lungs in this disease is distinctive and there was no doubt about its identity, especially in view of the amount of material at our disposal. However, measures were taken to have microscopic examinations made by the chief of the biological laboratory of the Bureau of Science, who confirmed the diagnosis. Similar work was done later by the pathologist of the Bureau of Agriculture, who recognized the changes in the microscopic structure described by Smith[1] as characteristic of contagious pleuro-pneumonia.

Within the city of Manila, seven corrals were infected by Australian cattle. These were placed under quarantine, and no new cattle will be allowed to enter them until the Australian and

[1] Smith. Twelfth and Thirteenth Annual Reports of the Bureau of Animal Industry, Washington, p. 143.

exposed cattle in them have been slaughtered and the corrals disinfected.

The observations made at the matadero, and the cablegram, compelled the recognition of the existence of contagious pleuro-pneumonia in Australia and the application of suitable measures to prevent the further infection of the Philippine Islands. Experience elsewhere has demonstrated that a quarantine of at least three months is essential to prevent the introduction of infection. General Order No. 16, published in this number of the REVIEW, was designed to meet the requirements of the case, with as little loss to importers as possible.

Over 900 head of cattle, on four vessels bound for Manila, were on the sea on the date of issue of General Order No. 16 and were affected by the provisions of paragraph 2 of the order. These were transferred to lighters when available or permitted to be landed and driven to corrals near the water, after which the streets were disinfected. All were required to be taken to the matadero in trucks, or by water, a provision designed to prevent the spread of infection on the streets.

The veterinary inspector at the matadero was instructed to be guided by the following paragraph in Ostertag's Handbook of Meat Inspection:

> From a sanitary standpoint, no objection can be raised against the release of the meat as permitted by the Imperial Animal Plague Law, for the meat of animals affected with pleuro-pneumonia is eaten without any bad effects. In cases where the lungs are not seriously affected, the meat may be considered as marketable. If, on the other hand, the animals are slaughtered during the crisis of the disease in an acute, feverish condition, in which the animals subjected to emergency slaughter do not bleed adequately, the meat is to be sold under declaration as an inferior food material. The meat is usually absolutely excluded from the market in cases in which emaciation and edematous processes have developed during the course of the disease.

Special precautions were taken to prevent the spread of infection from the matadero, where the cattle were slaughtered. Careful records were kept regarding the number of infected cattle slaughtered. One shipment of 398 head showed 9 per cent infected, another of 262 head showed 6 per cent infected. Some of these cattle showed evidence that they had been infected with pleuro-pneumonia for at least a year. Two Indo-Chinese animals exposed to infection from Australian cattle showed unmistakable evidence of the disease.

One hundred and forty-five head of Australian cattle have been sent to the provinces since May 21. All but two of these are definitely known to have been slaughtered. The probability

is very strong that these two have been killed, as Australian cattle are too wild for work purposes.

Two hundred and forty-one head of cattle and carabaos have been sent to the provinces after exposure to infection from Australian cattle. Satisfactory progress is being made in locating such of these as have not been slaughtered.

Of about fifteen head of Australian cattle kept at the San Lazaro immunizing station, two developed symptoms of the disease. The two cases died, showing typical evidence of pleuropneumonia. Two animals, one native and one Indo-Chinese, were inoculated in the tail and showed the typical result that follows such inoculation.

The permanent exclusion of Australian cattle from slaughter in Manila is recognized as a serious matter. In consequence, the Bureau of Agriculture has sent Dr. Frank G. Gearhart to investigate the distribution of dangerous communicable animal diseases in Australia. He was instructed to ascertain from what ports healthy Australian cattle could be obtained for slaughter in Manila and to what extent the Commonwealth and State governments of Australia would assist in the necessary measures to guarantee the shipment of animals free from infectious diseases.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF PUBLIC INSTRUCTION,
BUREAU OF AGRICULTURE.

MANILA, P. I., *July 19, 1910.*

GENERAL ORDER
No. 16.

In view of the fact that contagious pleuro-pneumonia (lung plague), a disease affecting cattle and other bovine animals, is reported to prevail in all the States of Australia, except Tasmania, and in view of the fact that this disease has been discovered in cattle imported into the Philippine Islands from the port of Wyndham, in West Australia, and in view of the further fact that this disease may be disseminated by the continued importation of cattle into the Philippine Islands from that country, the following rules and regulations are hereby promulgated:

1. In accordance with section 2 of General Order No. 15 all ports of Australia are hereby declared to be infected with a dangerous communicable animal disease, as defined by Act No. 1760 of the Philippine Commission.

2. All cattle now en route to the Philippine Islands from Australia shall be regarded as infected animals, and shall be held for slaughter in the city of Manila only; and under such restrictions as may be prescribed by the Director of Agriculture. All shipments made subsequent to this date shall be subject to the provisions of General Order No. 15, with the additional conditions hereinafter provided.

3. All shipments of cattle leaving Australia on and after July 25, 1910, shall be regarded as infected with pleuro-pneumonia and shall not be permitted to be landed in the Philippine Islands until a period of not less than ninety days shall have elapsed subsequent to the date of embarkation at the port of origin, and until found to be free from pleuro-pneumonia.

4. All cattle now held in the city of Manila which have been imported from Wyndham, in West Australia, cattle which have been in contact with cattle imported from West Australia, or cattle which have been kept in corrals used within ninety days for the storage of West Australian cattle, are hereby ordered to be held for slaughter in the city of Manila, or until a period of at least ninety days shall have elapsed after last exposure to the infection of pleuro-pneumonia.

5. Until further notice shipping permits to accompany cattle and carabao leaving the city of Manila will not be issued, except when satisfactory evidence is presented that the said animals have not been exposed to the infection of pleuro-pneumonia. Cattle which have been stored in corrals used for West Australian cattle within ninety days prior to the proposed date of shipment shall be regarded as having been exposed to the infection of pleuro-pneumonia.

6. These rules and regulations shall take effect on and after their approval by authority of the Secretary of Public Instruction.

G. E. NESOM,
Director of Agriculture.

Approved: By authority of the Secretary of Public Instruction.

THOMAS CARY WELCH,
Acting Executive Secretary.

MANILA, *July 19, 1910.*

THE CULTIVATION OF COFFEE.

[EDITOR'S NOTE.—The following information regarding the cultivation of coffee has been gathered from Farmers' Bulletin No. 4, of the Department of Agriculture of New South Wales, and from articles on the same subject appearing in the Queensland Agricultural Journal. These are of course in noway connected, but as the material in one was found to supplement the other very satisfactorily, we have combined portions of each in this article, in the hope that they will be useful to Philippine coffee planters.]

CULTIVATION.[1]

Deep, rich soil of a free character, and with good natural drainage, should be looked for when selecting a locality for coffee growing. Soil showing low proportions of phosphoric acid and potash will not yield good crops of coffee.

Coffee plants are raised from seed, sown in carefully prepared nursery beds, or if only a small number are required they are easily raised in nursery seed boxes. The seed should be sown a little more than twice its own depth, the incised side downward. Having placed the seed at the requisite depth, soil should be lightly sprinkled over it, and each row of seed, when completed, evenly pressed with a flat board. The seed should be sown not less than 6 inches apart in rows, and 6 inches between the rows. The seed bed should be protected with a covering of any light handy material, stretched or laid across the top of the side frames of the seed bed, which frames should consist of light saplings or sawn wood battens, constructed at a height of about 11 inches.

These coverings are removed in the evening and replaced in the early morning. If the weather is not showery, of course watering at regular intervals will be necessary. During the period of growth the coverings should be removed at suitable intervals, i. e., on dull and showery days, and the plants gradually exposed to sunshine to harden them off. By the time the plants are 6 or 8 inches high the shading may be gradually dispensed with.

The more robust of the plants may be removed from the seed

[1] From Farmers' Bulletin No. 4, "The Cultivation of Coffee," by H. V. Jackson, Department of Agriculture, New South Wales.

bed and planted out when they are about a foot high, the best time for this operation being when the wet season has commenced.

It is very desirable to avoid windy days for planting, and the roots of the young plants should be carefully covered when they are being carried from the seed bed to the site of the intended plantation.

Coffee trees are laid out much in the same manner as when planting an orchard. In Ceylon 5 feet by 5 feet or 5 feet by 6 feet and 6 feet by 6 feet are the distances adopted; but 7 feet by 7 feet, and even 8 feet by 8 feet have been recommended for planting in this State.

As the young trees increase in height, the time will arrive when it will become necessary to perform the operation called "topping." This is cutting back the main stem at the height it is intended it shall form the future main trunk. Where manual labor is cheap and plentiful, about 3 feet from the ground is considered a good average height to cut the shoot, but in this country, where the soil will in most cases be cleaned and tilled by means of a horse cultivator, it is perhaps advisable to provide for the trunk being somewhat higher. The tree should not be cut until the brown bark is showing, for if cut while yet green, it will die back.

As expansion takes place in the growth of the young tree, it will become liable to be swayed by the wind, and the movement of the tree at the foot causes an opening in the soil. When this takes place, the earth should be replaced. For the purpose of steadying the tree it is a common practice to use a wooden stake. The usual method is to obtain stakes about 3 feet 6 inches or 4 feet in length. The stake is driven into the ground in a slanting direction in such a manner that it lies at a slight angle across the tree with the head of the stake facing the point from which the most prevailing wind blows. The stake and tree are tied with raffia or other suitable fiber, or piece of rag, admitting of a little play, so that the wooden stick does not wear into the bark of the tree.

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The coffee tree begins to come out in full bearing in the third year. The fruit, resembling a cherry, has an outer covering named the "pulp," inside of which are two beans. The beans are enveloped in two coverings, the outer called the "parchment," the inner thin covering the "silver skin."

The first operation dealing with the gathered fruit is that

of passing it through a pulper. From the pulper the beans pass into a cistern, where they remain for fermentation. After one or two days, according to circumstances, the fermented coffee beans are passed into washing cisterns, where the gummy substance adhering to the beans is washed away. When thoroughly washed, the coffee is spread out on a prepared level space or on trays for drying, preparatory to being dispatched to the nearest port of shipment, where it may be put through a further process of peeling, sizing, and packing before being shipped.

With regard to yields obtained by Indian coffee planters, it has been estimated that 100 acres in the third year yield a maiden crop ranging up to 20 tons, and good crops in the third and fourth years up to 40 tons.

It has been reported that in 1903, 394 acres were under cultivation in Queensland, of which 318 acres were bearing, the yield being 83,652 pounds, and at Herberton 615 pounds per acre were obtained.

HANDLING.[1]

If the coffee tree has been carefully watched, its naturally symmetrical growth will not have escaped attention. The branches, it will be seen, are opposite; that is, they come out in pairs on either side of the stem, and the leaves appear in exactly the same way on the branches.

The coffee buds grow from the axils of the existing or previously existing leaves or branches, which are called "eyes." These buds in the bearing season develop spikes or blossoms, and at other times leaves or twigs, which, when young, are known as "flush" or young wood in oppositon to the mature or old wood.

The first branches that appear are called primaries (*lit.* first branches), and each pair are alternate in their direction, so that if the first branch of a tree points north, its mate or pair would point directly south, but the next pair above it would point east and west, while the third pair would correspond to the first. All subsequent branches as well as leaves are, under normal conditions, always horizontal or nearly so. Any deviation from the horizontal, or curve, being common to all branches, they remain practically parallel throughout their growth, though the angle they bear to the vertical stem may alter at different stages of growth. The branches that grow directly from primaries are called secondaries, and the ones from them in their turn tertiaries. From this wonderful arrangement of nature it will be

[1] From "Coffee Cultivation in Queensland," by H. Newport, published in The Queensland Agricultural Journal, Vol. XXV, part 1, July, 1910.

seen that the coffee tree is able to bear a series of fan-like groups of branches as it were in layers and without interfering with each other. This constitutes what may be called the normal growth of the coffee tree or bush, but, while nature starts in a perfectly symmetrical system, there are many causes operating to interfere with the continuance of this symmetry, and to induce, or admit of, abnormal growth. One of these is the operation of topping. This induces the growth of suckers, which are vertical shoots from the stem, and must be dealt with as described under "Suckering" and "Centering." Branches also at times grow either upward, downward, or backward (i. e., toward the stem of the tree), which, it can be understood, interfere not only with the symmetry of the tree, and by rubbing against other branches, with the bearing of crop, but help to shut out light and air necessary for the fruiting of the branches below, and increase the cost of harvesting or picking by the irregularity of their position. Some of these abnormal branches, more especially those growing upward from a primary, from an independent head, and, for some unaccountable reason, have the power of apparently drawing more than their fair share of sap. These are hence known as "gormandizers," and, if allowed to remain, will develop at the expense of their parent primary branches, and sometimes of the whole tree. Again, it has been found from long experience that if the secondaries or tertiaries are left in pairs—that is, a branch allowed to grow out of each of the opposite eyes—they develop at the expense of the main branch, which will either cease growing or shrink from the point where it emerges between such pairs. Hence, pairs are also considered abnormal, and, if strictly not so, are at any rate detrimental to a uniform distribution of sap. On the other hand, where two or more branches appear from one eye—that is, on the same side of a primary—the term pair is not applied.

The maiden crop of a young tree is borne mainly on the primaries, and to some extent on the stem itself. Immediately after the rainy season, when the crop is half to three-quarters grown, the now matured wood sends out a flush of young growth which, though the primaries in a healthy tree may bear again, produces the bulk of the next season's crop. This flush will consist of numbers of young branches from each eye, not merely of normal, or the right kind, but abnormal, such as described above—viz, pairs, gormandizers, branches growing upward, downward, and backward—which *must* be thinned and sorted out in order to prevent a thick matted growth that would prevent light and air reaching branches below it or between it and the stem, thereby

reducing its crop-bearing capabilities and inducing fungoid and other diseases; to prevent waste of growth and energy of the tree, and to preserve the symmetrical form and arrangement of branches on which, as previously mentioned, depends to a great extent the cost and facility of the picking.

When the growth is young it does not require a knife, but can be quite readily rubbed or pulled off by hand, hence the work is called "Handling." The stem, primaries, and also secondaries are looked upon as the skeleton or foundation of the bearing wood of the tree, and as such their training and the regularity of their growth should not at any time be lost sight of while the tree is still young. The regulation of this annual flush or growth of new wood must be accomplished by some system if it is to be effective and satisfactory. The system adopted requires a knowledge of the style of growth of the tree, and the object to be attained, as well as the exercise of considerable discernment respecting many minor matters, such as the soil, season, health of the tree, aspect of the field, the weather, shade, etc. The object to be attained is the direction of the energies of the tree to the bearing of crops, and the elimination of all wood that will prove useless or detrimental.

The system upon which this may be done is a matter of much controversy among planters, as can readily be understood when so many factors that differ with almost every plantation have to be considered. Nevertheless, the first lesson given to a learner in a coffee-planting district consists generally of the plucking of a leaf, and his being directed to note the arrangement of the veins on the back of it, and to mold his system accordingly. These veins will be found to be alternate, and the basis of the most generally adopted and most successful system is an alternate arrangement of secondary branches on the primaries and tertiaries on secondaries. The next point to remember is that the skeleton branches of the tree must at all costs be preserved, and that while secondaries and other branches may be regrown if removed, primaries never can be. Hence, never cut a primary unless it be at the tip, and then only if there is a substitute there to take its place. All secondaries growing from the primaries within 6 inches of the stem having been first removed as directed under "Centering," the rest of them should, therefore, be removed from alternate eyes, on the mature wood only, so as to have no pairs, and all the abnormal wood described above be eliminated. If a primary or secondary dies back or breaks, another branch should be trained to as nearly as possible take its place. If this is carefully looked to while the tree is yet young,

a good sound system of growth will have been inaugurated which will very much simplify all subsequent work in connection with the plantation. During the spring of the year, after the rains, and generally two or three months after the blossom has opened and set, the trees flush, and the handling should be done before the growth has become too big and strong, so that the energies of the tree may be directed to the proper ripening of the crop and maturing of the wood it bears.

The first thing then is to "center," and the next to go carefully over every branch, and, starting from the stem or butt end, remove all the irregular and unnecessary wood. The wood left is then on alternate sides of the primaries and secondaries on the mature wood. At the tips of branches that are still green, sometimes lateral branches will make their appearance, but these should always be removed. A well-handled or pruned tree looks as though it had been combed out, all branches, young and old, coming *away* from the center all round it. Sometimes two handlings are done, but this, if possible, while very desirable, is expensive, and should not be necessary.

On the regularity of the handling depends the simplicity of the pruning.

PRUNING.

After the handling, the trees should not be touched again until the crop has all been picked off. By that time some of the flush that will have grown after the handling will have become too tough to take off by hand, and also some of the wood that has that year borne will require removal in favor of young wood of greater vitality. Pruning has, therefore, to be done with a knife, secateurs,[1] or some such implement, though the ordinary nonfolding hook-pointed knives are best. These should always be kept sharp, so that any wood may be removed by a clean cut without any breaking or tearing of the tissues.

With a fair working knowledge of the requirements of the tree, so far as branches and wood are concerned, the formation of a good foundation or skeleton, as I have called it, can be commenced while the tree is quite young. If this has been done, the plantation will be tremendously benefited throughout its whole life. Pruning is necessary to encourage the growth of new wood as well as lighten the tree of an excess and remove dead or useless wood, and, in fact, direct the energies of the plantation to the sole object of producing suitable wood for the next and following season, and even or uniform crops annually.

[1] Pruning shears.

This should be done, therefore, as soon as the crop is removed from the trees, and, if possible, between that and the opening of the new blossom. Sometimes this is not possible on account of a protracted picking season or an early blossoming, and the pruning may have to be stopped for a week or two while the blossom opens, but it should be continued and completed as soon as possible after any such delays.

The pruning proper will deal mainly with the old wood, though the principles involved are exactly the same as in handling.

As already stated, the primaries and secondaries, constituting as they do the foundation of the tree, should not ordinarily be cut.

As the tree grows older it will be noticed that the tertiaries bear most of the crop, and also that wood that has borne well one season seldom does so the following year, so when in the handling it is seen that a tertiary is bearing heavily, its natural pair, on the other side of the mother secondary, may be left to develop, and in the pruning the old tertiary is removed in favor of the new one. If there is a paucity of wood, two tertiaries are sometimes left growing in the same eye, i. e., on the same side of a secondary, but never more than two. It will be seen, therefore, that the tertiary and subsequent branches are constantly changing. Sometimes branches bear so heavily that so much sap is absorbed in forming and ripening the berries that insufficient is left to develop the branch itself; such wood is thinner than ordinary, and is known as a "whip." If these are left, they bear a few berries only at the tip, if at all, and hence are not considered worth retaining, and so are removed in the pruning.

Dead wood should be broken rather than cut. Occasionally—generally toward the end of primaries or secondaries—a thick knot of wood is formed at or over an eye, usually due to a bad cut when pruning, and this knot, instead of sending out not more than five or six shoots, as most eyes do at most, will produce scores pointing in all directions. These knots are known as "crows' nests," and the branch bearing them had best be cut right off just below the nest. Any attempt to prune out crows' nests is not worth while, and is seldom effective.

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At first the operation of pruning will be found woefully slow, but once the stage where one has to stop and think over each cut has passed, it will be found not only more easily and quickly done, but one of the most interesting of field operations, the

pruning of coffee being quite different from that of almost any other fruit tree. Very heavy pruning should be avoided, as being generally expensive and unnecessary, inducing the growth of gormandizers, and, it is said, by weakening the tree, exposing it to possible attacks of insect pests. Too light pruning, on the other hand, is apt to induce fungoid pests.

It is not always possible to prune according to rule of thumb, but while it is necessary that the work should be intelligently done, the system should be followed as nearly as practicable. It must be borne in mind that as the pruning arranges for the right-growing and good-bearing wood for the season following, the effect of a good, bad, or indifferent pruning will be shown in the season next after rather than immediately following the work.

PRUNING OLD COFFEE.

The foregoing deals with young plantations as well as such as may be considered mature—i. e., from five to ten or even twenty years old. In pruning plantations older than this, especially if the stems of the trees have become gnarled and knotted with age, the strict adherence to the system must be relaxed somewhat in favor of the encouragement of good wood wherever it may be produced under the lessening vitality of the tree. Such trees will sucker less and make less wood generally, but the air funnel down the stem must be kept clear by centering, while gaps caused by broken or dead primaries will have to be filled in by wood from neighboring branches that in younger trees of greater vitality would be considered quite irregular because unnecessary.

Fields and plantations that have been abandoned or neglected may be brought into good form again, but must be judiciously and carefully pruned. The drastic pruning that would be necessary to bring them into the correct shape at once would involve reducing them to "parrot poles," i. e., little more than bare primaries, and give them such a shock as to render them useless as crop producers for some years, if not kill them outright. Such old coffee must first be carefully suckered and centered, for which the pruning saw will often have to be brought into requisition where the suckers, etc., are too thick and strong for the knife. This much, with the breaking off of dead wood, is often enough for the first year's pruning. In the second season more of the cross wood and unnecessary secondaries may be removed, and the trees brought into thorough shape finally by about the third season. The disastrous effect of a sudden heavy

pruning to old or neglected trees has often been used as an argument against pruning at all, though it is really only an argument against pruning without exercising common sense.

THE SYSTEM OF NO PRUNING.

During the last ten or twelve years there have been many systems of coffee culture promulgated, which among other things eliminated the process of pruning, and as pruning is somewhat expensive these have received considerable credence. It is admitted, however, that pruning increases the size and improves the quality of the coffee bean. The elimination of this work, on the other hand, does not necessarily involve the immediate deterioration of the trees or reduction of the quantity of the crop. Under conditions where the rainfall is not too heavy, and labor is unobtainable or prohibitive in cost, after the first crop or the fourth year of the plantation this work may be reduced to a merely nominal operation or even eliminated if unavoidable.

This is not advocated, however, and, if done, the centering and suckering must be carefully and regularly carried out all the more strictly. The presence of shade, also, by reducing the natural tendency of the tree to flush so prolifically, reduces also the need for pruning to a considerable extent.

No pruning means also increased cost of picking, on account of the hindrance caused by the presence of a great deal of unnecessary wood, as well as an ultimate reduction of quantity as well as quality of the crop by the wealth of foliage on the outside of the tree preventing both flush and croping nearer the stem, and turning the trees into what are called "umbrella trees"—that is, trees with only top primaries and outside wood.

While the handling of young trees just so soon as they begin to make wood is urgently advocated, and a subsequent pruning or two after the maiden crop is distinctly advisable, the annual pruning subsequently may be materially reduced, or even omitted, and coffee still cultivated with considerable, if not as great, a measure of success. To do no pruning or handling whatever from the commencement, however, would be but to court disaster.

SHADE.[1]

The question as to whether shade for coffee is required is one of some little difficulty. At first coffee was universally planted and cultivated without shade. It was then noticed that it lived longer and apparently thrived better, in some localities at least,

[1] From "Coffee Cultivation in Queensland," by H. Newport, Queensland Agricultural Journal, Vol. XXIV, part 6, June, 1910.

under permanent shade, and a reaction set in, and estates sheltered by the shade of various and sundry trees became the vogue. Later it began to be questioned as to whether the disadvantages outweighed the benefits of this method of culture. It was found that shade reduced the crops by one-third to one-half, and at the same time somewhat increased the cost of picking but that it also reduced the cost of maintenance of estates by almost eliminating weeding and pruning was admitted. The fact that the shade of ordinary trees such as were then used being found to utilize an amount of plant food that would otherwise be available for the coffee had almost carried the day, and demonstrated that shade in coffee plantations was a huge cultural mistake, when deeper investigations made a discovery that put a new complexion on the whole question. This was that certain trees of the plant order of Leguminosæ have the same properties as many smaller plants, such as beans and peas, used for manurial purposes, that is, that they acted as hosts for certain nitrogenous bacteria which had the power of obtaining free nitrogen from the atmosphere and turning it into nitrates and nitrites, and rendering it available as plant food. The presence of these bacteria being evidenced by the presence of nodules on the roots, in the same way as on cowpeas, etc., so that these trees stood in virtually the same relation to permanent crops, such as coffee, cocoa, etc., as cowpeas, beans, etc., stood to annual or serial crops. This meant that while the objections to, or disadvantages of shade, viz, reduction of amount of crop per tree, slower ripening, increased cost of picking, and, especially if overdone and in a wet climate, an increased tendency to fungoid diseases remained, the advantages of the reduction of weeding and pruning, and the safeguarding against frost, wind, drought, or wash in floods was materially enhanced by an appreciable increase in the fertility of the soil. While, therefore, coffee would not cease to develop properly, or thrive continuously without shade, while labor is at so great a premium as it is at present in Queensland, the use of shade, provided only it is of the right kind, offers advantages that outweigh the objections. While shade may be generally advantageous, it nevertheless remains a matter which must be decided by the grower in view of his local conditions, and in conjunction with other economic considerations.

In the northern territory and west of the coastal ranges in Queensland, where the climatic conditions may be almost termed arid, shade would be more or less essential to success, but at elevations or at greater latitudes in the coastal portions of Queensland, where the sun is not so fierce and the rainfall co-

pious and reliable, the conditions may be such as to render it more or less unnecessary, if not prejudicial.

Where shade is determined on, it is advisable to plant it at the same time as, or soon after, the coffee, and not to plant the coffee under existing trees. The following are suitable leguminous trees that will do well anywhere in Queensland: The Gwango (*Pithecolobium saman*), the Nicaraguan Madre de Cacao (*Gliricidia maculata*), the Rain trees (*Albizzia stipulata*), Siris (*Albizzia lebbek*), *Albizzia moluccana,* and almost any of the Erythrinas, several of which are indigenous. These should be planted 25 to 40 feet apart, according to the size the trees ultimately attain.

When pruning the coffee, such of the branches of the shade trees as are within reach should be cut back as high as can be conveniently reached.

Bananas make a useful shade for coffee, and while the planting of bananas as shade is not advocated, the planting of areas leased for bananas with coffee would be quite successful as far as the growth of the coffee is concerned, and later, when the cultivation of the bananas is given up, as is usual in four to six years, a valuable plantation of a permanent nature and an age to show returns would be left, instead of—as so often at present—nothing, or worse than nothing, a field of noxious weeds.

Advantage may be taken of trees in coffee culture other than for shade, as, for instance, when, after clearing, a field is found to be exposed to wind, when belts of hardy trees, such as the *Grevillea robusta,* etc., may be planted on the windward side, or in rows through the coffee across the line of the wind. Also on elevations where slight frost may be feared, coffee can be sucessfully grown in narrow clearings of not more than a chain wide, cut north and south, with areas of similar width of standing scrub left between such clearings.

CATCH CROPS.

It is often asked whether catch crops can be grown between the lines of coffee, at least during the first few years.

The space is generally there for three years, more or less, and it may seem a pity to have to keep it clean weeded and yet not utilize the ground. Such intercultivation, however, involves either exhaustion of the plant foods for the permanent crop, i. e., the coffee trees, or intense cultivation, i. e., ample tilth and manuring, which, with labor at a premium, is generally not afforded the field. Hence, it will be found more satisfactory

all round if the field is left entirely to the coffee trees, since they will want all the space as well as plant food in a comparatively short time; and the other farm crops be grown in a separate area.

It is a cultural mistake to think that maize or millet (sorghums, etc.) are any advantage to coffee. Any shade or protection afforded is more than counterbalanced by the heat, shutting out of air, and utilization of moisture and plant food the coffee would otherwise get. If the soil be somewhat sandy a crop of ground nuts (*Arachis hypogaea*) might be produced, but these will subsequently be found troublesome to eradicate and a woeful attraction to rats and similar vermin. Cotton of the smaller upland varieties might also be grown, but a note of warning must be given against any form of root crops—ginger, turmeric, yams, and especially sweet potatoes are particularly detrimental to the coffee. Bananas are about the only crop that can be grown with coffee with success. The banana does not seem to take from the soil just what the coffee requires, and the shade is not too dense for the coffee. By the fourth or fifth year at latest, however, these should be cut out.

MANURING.

It is not proposed to go fully into the matter of manuring in this treatise, for the reason that it is a big subject, and that, ordinarily speaking, the soils of Queensland are so rich that the manuring of coffee is not likely to be required for many years. Manuring, of course, becomes necessary in estates that have for many years been growing the one staple in the same spot, but is expensive, and should not be required in this country for at least ten years, even on the poorer lands. Where artificial or chemical manures are used they should be applied superficially when the berries are beginning to form milky kernels. These manures should be mixed after a careful study and analysis, if possible, of the soils. Bulk or heavy manures are best applied after the crop is off; generally the work follows the pruning, and the prunings are at the same time buried. Bulk manures, such as farmyard or cattle manures, are difficult to obtain in this country; but to the matter of saving waste material for manurial purposes on a mixed farm a great deal more attention could be given by the Queensland settler with advantage.

In coffee the pulp will form the foundation of a useful compost, which may be built up near the pulping house, for saving of transport, with a layer of pulp, say 6 inches thick, a sprinkling of lime, a layer of dead leaves, weeds, and organic rubbish,

and a layer of soil alternately. All ashes, animal and vegetable matter from the house and buildings may be added with advantage. This compost should be left for a year before being used, and then the admixture of a small quantity of bone dust adds to its value as a fertilizer. This may be spread over the ground and plowed, forked, or dug in, or where this is not possible be put in shallow pits behind the trees, well mixed with soil.

This compost is often used for what may be called the irregular manuring, when only trees that have overborne, or for other reasons want toning up to bring them to a par with the rest of the field, are treated.

By far the cheapest method of manuring is, of course, green manuring. With coffee the use of beans and peas is out of the question, on account of their climbing propensities, as the coffee trees would be smothered; but any nonclimbing leguminous plant, such as the pigeon pea (*Cajanus indicus*), may be used to advantage, and plowed or dug in, especially during the first few years after planting or during the wet seasons, when weeding is difficult.

THE INTRODUCTION OF IMPROVEMENTS INTO INDIAN AGRICULTURE.[1]

By HAROLD H. MANN, D. Sc.,

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The introduction of improvements into Indian Agriculture is surrounded by peculiar difficulties. The fact that, generally speaking, the agriculture of the country is in the hands of very small holders, who form a naturally nonprogressive class, is the first of these. Perhaps of equal importance with this is the rigid separation, which has long existed and still exists, between the different classes of society throughout the larger part of the country, for as a result of this, the educational movements of the past few years have hardly touched the cultivator of the land. He, in fact, still remains largely out of contact not only with progress, but also with the knowledge of progress. And, if you add to these reasons the fact that the Indian farmers are usually men whose capital is little more than the ownership of their very small area of land, who work almost entirely on borrowed money, there results a condition of things which is eminently unfavorable to progress.

This condition of things places India in the opposite extreme to those countries where the application of modern scientific discovery to agricultural practice has been most marked. Take, for instance, the United States of America. There your farmers are men of energy, of, at least, a little capital, and who are intensely alive to all that is passing in the great world; here, on the other hand, they are isolated, they are poor, they are usually content to go on in the way of their fathers. There, the existence of a large and well-organized agricultural department, of agricultural societies, of rural banks is the result of initiative among the farmers themselves; here, that initiative is all but entirely absent. There, as a result, experiment and discovery are followed closely by a large and intimately interested community; here, the results of any experiment or any discovery

[1] From The Agricultural Journal of India, Vol. V, part 1; January, 1910.

have to be forced on the attention of the people, and its adoption in practice has to face an amount of inertia and a lack of available capital that would seem inconceivable in most other countries.

And yet it must not be understood that the Indian cultivators are themselves hopelessly conservative and prejudiced. The difficulty seems rather to be, first, to get information actually into their hands from a source in which they have confidence, then to convince them of the utility of the suggestion which is made, and finally to show them that it will pay them to adopt it. When this has been done, the increasing experience is that the Indian cultivators are by no means overconservative. They are quick, in fact, to see any advantage. But, owing to their economic position, they must be sure of the disinterestedness of the information, they must be fully convinced of the value of the improvement, and they must be sure it will pay.

And what will pay under Indian conditions is quite a different thing from what will pay in many western countries. It is impossible to estimate the value of any method or of any change, unless the financial conditions under which a cultivator works are fully realized. As already stated, it is probable that over the greater part of India a cultivator does not have any ready capital. He has to borrow every year, either in money or in kind, for the purpose of meeting the expenses of cultivation, and the rate of interest which he has to pay often, if not usually, amounts to from 25 to 75 per cent per annum. It is, therefore, not sufficient that an expert in agriculture can prove to himself that a new method will give a return of 10 or 20 per cent over existing practice. Account must also be taken of the extra capital involved and the rate of interest which will have to be paid for it. As the cultivators have no capital they can take no risks. Unless they can be shown that the new method is a certainty, the cultivators will not, and rightly will not, take it up. A certainty will mean, as a rule, to a ryot, something which will give him a return of over 25 per cent on any extra capital invested, and this fact must be continually in the minds of all those who propose innovations in Indian agriculture. This means, in other words, that until cheaper money can be made generally available, any improvement which can be brought into practice, if it involves any outlay, must be of a very marked character. It means, further, that the connection of effort for cheapening of credit by means of coöperation or otherwise, and that for agricultural improvement is very close—closer perhaps than is generally realized.

But apart entirely from these questions, the introduction of improvements into Indian agriculture is no easy matter. But a considerable amount of experience has been gained in the last few years. Many failures have occurred: some successes have been obtained, and with a view to bring together the results of these experiences for future use a committee was appointed at the meeting of the board of agriculture in 1908 to consider and discuss them, and express an opinion as to their applicability in the future. A second committee was appointed in 1909, and the results of its deliberations, modified as they have been by careful local examination of the statements, will be issued very shortly. It seem, however, that there was room for a general statement of the methods which had been found to be most effective in the present article.

To introduce anything which may be considered an improvement in the special conditions of Indian agriculture, the first necessity is that you should be absolutely certain that your process or implement is actually an improvement under the conditions existing in any particular spot. This would, at first sight, seem a truism, and so it is. And yet its neglect has led in the past to the greatest failure, to the loss of confidence by the ryots, and to setbacks to progress whose seriousness it is difficult to estimate. In the older days, for instance, American cotton was introduced into India in very large quantities. No experiments were made as to its suitability in many of the areas where it was planted, either agriculturally or economically. What was the result? The cotton failed in many areas, of course. This would not have mattered so much, perhaps, in itself, but confidence was lost, the department introducing the cotton was thought by the cultivators to be unpractical, and they hesitated, to say the least, to adopt any other suggestion. The same story has been repeated elsewhere; new implements, new crops, new methods, excellent in themselves, have occasionally been introduced without adequate knowledge of local conditions, and without sufficient testing. The result has too often been failure, loss of confidence, and general distrust. It can not be too strongly insisted on, that nothing can justify the recommendation of any supposed improvement, unless it has been preceded by careful experiment, and by the most careful local study.

But what does this careful local study mean? Does it simply mean that the method has been carried out successfully on an experimental farm in the same neighborhood? So far as it goes, such experimental testing is excellent, but it is by no means all. Anyone who has dealt with this subject in practice

must know that the difficulties which occur to an experimental farm manager are a very different thing from those which occur to a ryot. For instance, on an experimental farm a particular imported iron plow does excellent work, it is more economical in every way, and the crops are better. You take it out, and are met at once by a villager who acknowledges its value, but at once asks how he is to get it repaired if he adopts it. No country *mistri* can deal with it, spare parts can not be stocked either by the cultivator himself or in the village shop, and the plow, however good, has to wait until this difficulty is overcome. Or again, you find a particular manure for sugar cane. It gives excellent results in growth and yield of *gul*. You recommend it, and are at once met by the statement that this manure always lowers the value of the *gul*. The lowering is relatively small, but there it is. It is probable that among the mass of samples on your experimental farm the difference has never been noticed, especially as it is a commercial difference not capable (so far as I know) of being detected by chemical analysis. But you must answer the difficulty or your manure will have to wait. And so on. Instances might be multiplied, but the above must suffice to show the absolute necessity of local study as well as experiment before it is attempted to introduce an improvement. The whole resolves itself into being absolutely certain that your novelty is good and is applicable under the special local conditions.

But this being insured, the next step is to secure the confidence of the people. And here is perhaps the greatest difficulty of all. Indian ryots have from time to time been exploited by people of the most various kinds, sometimes with, sometimes without, intention, so that they are rightly suspicious. If anything is suggested, they at once look for the motive. What has the man to gain by it? What has the government he may represent to gain by it? Is he the agent of someone else? Such are the questions which at once rise in his mind, and have to be met.

The winning of confidence has been accomplished in various ways; but whatever the method, it is of the first and most vital importance to the whole success of the work attempted to be done. In many parts of India the attempt has been made by the formation of local associations of agriculturists and those interested in agriculture among whom the improvements suggested can be discussed, by whom they can be tried, and, through whom, when successful, they can be extended among the surrounding people. Perhaps the greatest success in this direction

has been achieved in the Central Provinces. There the members are nominated by the local authorities; they have as their chairman the district officer; whenever they meet one of the senior officers of the agricultural department is present, and membership involves readiness to try some novel method on the member's own land. All proceedings are in the vernacular, discussions are free, and enthusiasm is often aroused, and these associations have succeeded in bringing the agricultural department into touch with the cultivators, and in giving them confidence in one another. As a result numerous improvements have been made. Improved varieties of *Jowar*, sugar cane, and other crops have been introduced, the fighting of smut in *Jowar* by pickling the seed has been largely adopted; in some of the backward tracts great improvement in rice cultivation has taken place, and new, improved implements are now in some districts regularly used. I have quoted the Central Provinces because the idea of agricultural associations has been more developed there than elsewhere, but they have been formed in other provinces, sometimes as more independent, sometimes as more official bodies, with varying success. The movement is in its infancy, but enough has been seen to indicate the general lines in which they are likely to be most valuable. In the opinion of the committee (whose work I am summarizing), it may be said that "their utility seems largely to depend on the presence of a body of men directly interested in cultivation, on the personal touch of the higher staff of the agricultural department with the members, on the definite engagement by the members to do definite pieces of work, and on the regularity of meetings, inspections, and reports * * *. No association, large or small, should be formed till there is something of the nature of a spontaneous demand on the part of the people themselves or until the agricultural department is in a position to advise and guide them in their work. Where the agricultural department has failed to create such interest the association is bound to fail in its object."

The next method which has been used is that of demonstration of the value of improvements on the spot, usually by instituting a demonstration farm for the purpose, or by temporarily hiring some land from an actual cultivator. In either case, if it is to do any good, the confidence of the people must be won either before or during the demonstration itself. Nothing is more common than to find that the cultivators have a haughty disdain of what is done on a Government farm; it is considered that, however good the results may be, they can only be done under conditions of money and personnel that only government

can secure. Hence, except in exceptional cases, it is probably not wise to institute a special permanent farm for demonstration purposes; by far the better way, so experience shows, is to engage a temporary plot or utilize a private farm. It is essential that everything be done as a cultivator can do it, and that the man in charge should be a cultivator himself, or at any rate one with whom they can get into perfect intimacy. Supervision there must be, but it is essential that the man actually in charge should be of the same type as the people he is working among. He has then two things to do, to gain their respect and confidence, and to show that his method is better than that which is adopted round about him. He must understand, too, that the success of the demonstration will be judged by the extent to which it is adopted, and that this is the only test.

Working on these lines it has been possible to make considerable progress in Madras, in the Central Provinces, and in several other parts of India; new varieties of crops have been introduced, new methods have been largely adopted, and it seems likely that this will form one of the most effective means of introducing new matters into the practice of cultivators.

These methods are not limited to matters of cultivation. New machinery can be equally well shown by men of a similar type. A gang of men has for instance been employed for years in Bombay, demonstrating from place to place the best methods of boiling *gur* (crude sugar); the use of reaping machines has been brought to the notice and into the practice of agriculturists in the Punjab similarly, and many other cases might be cited. The essential point in it all is that everything should be shown under cultivators' conditions, by men who are themselves intimately in touch with the people and their problems.

Other methods have been utilized for gaining the confidence of the people, the essential preliminary to doing very much for the introduction of improvements. In the United Provinces and in the Central Provinces advantage has been taken of the period of stress following severe famine to help the cultivators with large quantities of good seed and the like, and the confidence thus gained has been very great. Again, traveling agents have been employed in going from place to place, generally on some special quest, and getting into touch with villagers and cultivators in Bombay. In this case the men employed should be of considerable experience, be thoroughly imbued with the fact that they are the servants of the people, and be, if possible, cultivators themselves. But confidence must be gained. I would again insist on the matter, before anything material can be done.

When the confidence of the actual cultivators has been secured, the greater part of the difficulty is over. It is then only a matter of showing, of clearly proving, that what you recommend is good and will pay, and the chief trouble is to insure that your information actually reaches the cultivators themselves.

The number of methods which can be adopted for this purpose is very great. The most certain in effect have been already referred to, the formation of local associations of agriculturists where matters can be freely discussed, and in connection with which members will make trials for themselves and for their neighbors to see, and the institution of demonstrations by the agricultural department either on cultivators' land specially hired for the purpose or by special demonstration farms. Where applicable, both these methods are effective in almost all cases. The spreading of demonstrations over larger areas under the control of the agricultural department, however, involves a very large staff, and a very well-trained staff. This is not likely to be available for many years to come, if ever, but so far as it is available, whenever there is anything definite to be shown, the method of local demonstration has proved itself extremely effective. As already stated, the committee feel that experience has shown that plots taken from cultivators for a short period, and placed under a man who is himself a cultivator well trained for the particular demonstration in hand, are more effective than actual demonstration farms. Such plots should be small, should limit themselves to special and definite demonstrations, should show nothing which is not certain to be a success, and should be accessible to surrounding cultivators at all times.

But beyond the relatively small area which even a very large extension of such demonstration areas would cover, we must rely on agricultural associations to meet the need to a large extent. As already described, they enable us to carry the ocular demonstration of our improvements to a very much larger area, but their number is circumscribed by that which can be covered by the senior staff of the agricultural department, who must act as inspiring and suggesting influences to everyone. However enthusiastic local men may be, they expect and require constant touch with the experts of the agricultural department, and the extension of associations is limited by the possibility of giving that touch. It is no use sending inferior men to them, those employed to guide and assist associations must be of considerable experience, usually well skilled in the vernacular, capable of inspiring work, and with a stock of suggestions for improvement which are proved successes, and which will meet the cultivators' needs.

The last point perhaps merits a short digression. It is impossible to insist too strongly on the necessity for finding out what are the cultivators' difficulties and needs, before any attempt to introduce improvements is made. It is a slow business to attempt to bring into use anything for which a need has not arisen. It is useless to talk of artificial manures to a man whose crops are failing for want of water, and yet this has often been done in the past. It should always be remembered that the finding out of the cultivators' wishes and needs is the first necessity, and the devising of means to meet them the second, and their presentment to him in one way or another then follows and is welcomed.

To enable improvements to be carried out over a wider area, we must return to those methods which have been successes in other lands, such as exhibitions, shows, publications, and so on. They will be successes if you already have the confidence of the people, otherwise they may cause much talk, but will lead to little real effect. Hence, the value, so far as ultimate results are concerned, of these methods has been various. But if the essential condition is obtained, then a great deal depends on the manner in which these methods are adopted. A large amount of energy has been spent in recent years in organizing large exhibitions in several Indian Provinces in which a vast amount of work has been put into the agricultural section. These have been held in Bombay, at Calcutta, and the culmination was reached in that recently held at Nagpur. In each of these cases, and particularly at Bombay and Nagpur, very great efforts were made to secure the attendance of large numbers of actual cultivators, and to show them everything which was to be seen. These exhibitions have certainly been effective in inspiring very great interest, have made the agricultural departments more widely known, have spread the knowledge of advanced methods into corners where this had never before penetrated, and have directly led, in the hands of the more substantial cultivators, to the introduction of seed and implements.

Such large exhibitions can only, however, be organized on special occasions and under special circumstances. Local smaller shows can he held at more frequent intervals, and range in size from institutions like the Lyallpur fair in the Punjab, annually attended by 100,000 people, to small *taluka* shows in parts of the Bombay Presidency, or to the demonstrations which are made in connection with smaller cattle fairs and festivals in Madras. On the whole, the committee have felt that if such shows are to lead to real effective improvement, their organization should

be very carefully done. While local effort may and should arrange the show, the part which the agricultural department takes in it should be very carefully organized and attended to by one of the superior staff of the agricultural department. Agricultural products which are not and can not be produced on the cultivators' own lands should be excluded. As many things as possible should be shown in action; as these are always centers of attraction. Popular lectures should be combined with practical demonstrations. Farm produce should be arranged in sufficiently large quantities to allow of being handled by those interested in them. If these conditions can be attained, it is probable that a larger number of smaller shows are more useful than fewer shows on a larger scale.

It may be well to consider the whole question of agricultural publication together, so far as it is made for the purpose of introducing improvements into practice. In some parts of India vernacular agricultural journals are issued, in some, information which it is desired to spread is sent out in leaflets, in others again, the general press is considered sufficient, and in Madras an agricultural almanac in the various vernaculars is published. It is natural that in a matter like this the methods should differ in each part of India, as the habits of the people vary. But whatever is done must be done well, and must be written simply and in such language as the cultivators know. This latter point is of importance, for there is a danger that if a translation into the vernacular be made by a nonagriculturist, it will abound in phrases and words totally unintelligible to the ordinary cultivators. Again, any article, any leaflet, should be short, perhaps not exceeding a couple of pages, and should contain one definite fact or the description of a single process which it is desirable that the ryot should know and adopt, with illustrations whenever possible. The circulation of such material is a difficult point. A vernacular journal, which has to be paid for, is excellent if it only has a large enough circulation among actual cultivators. Such a circulation is not very easy to work up, and the agricultural department in the Central Provinces is the only one in India by which this has been really accomplished. Leaflets, being distributed free, can be spread more widely, but much of the distribution is useless. To avoid this they are, in Bombay, generally used (1) in connection with demonstrations of implements and methods, as, for instance, at shows; (2) in a limited area where special need has arisen. They are rarely distributed without at the same time arranging for the presence of an officer who can explain the nature of the improvement.

Even with all these precautions, the extent to which such leaflets are really useful is still problematical.

Of course, it is possible to use the general vernacular press for publication of agricultural information. This is now very widely read, in by far the greatest amount, however, among the nonagricultural classes. Articles and material are, however, freely taken, and with a properly organized system of contribution, a considerable result might be expected to flow from its utilization. If material is sent to the press for this purpose, no efforts should be spared to give the contributions a popular readable form such as is likely to command attention.

We have now considered most of the methods which have been adopted to insure a wide extension of the knowledge of agricultural improvements. But there is one other to which I would like briefly to refer, namely, the training of the sons of cultivators in practical agriculture either on the farms of the agricultural department or in special institutions. This has been carried on to a certain extent at Nagpur and also in Bombay. The whole matter is, however, as yet in an experimental stage. Difficulty has been found in attracting the right class of students, and those who come do not by any means always wish to go back to improve their own land. Where the right type of boys have been attracted, and where the course has been short and practical throughout, there have, however, been a good number of cases of success. But the whole question of the large applicability of such training is at present doubtful, and a very considerable amount of experiment will be required, and that under different conditions, before the best method is ascertained.

I might refer to many other methods which are of narrower application, but have been of service in particular cases. In certain cases lands have been colonized with good cultivators with very great effect on the character of the agriculture round about them; in others, individual cultivators have been sent to new areas to teach the people round about them their own methods, and so on. But again it must be recognized that there is no general method; the conditions differ so much from place to place, and from province to province, that it is absolutely impossible to lay down anything more than indications of such methods as have, in particular places, given successful results in the past.

In conclusion, there is sufficient information in hand now to indicate that, in spite of its peculiar difficulties, agricultural improvement is not impossible in any part of India. There is, however, no royal road—the progress is, and must be for a long

time to come, very slow. But, whatever methods be adopted, the actual process must be the same. To find the cultivators' real difficulties, to discover a practical and certain method of meeting those difficulties, to gain the confidence of the people: these all must precede any definite attempt at a propaganda. If the attempt is made to introduce so-called improvements without these necessary preliminaries, then not only will failure result, but what confidence there may be will be undermined, and progress in the future will be made harder. Recognize the necessary order of events, try to satisfy the cultivator's needs and not something you imagine he ought to need, let your experiment be based on the requirements of the ryot, and success, though slow, will, if past experience be any guide, be sure.

ARBOR DAY IN THE PHILIPPINES.

By JOHN S. POTTER,
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When Arbor Day, following its annual observance in the United States, was announced for the Philippines, one might have questioned for a moment the wisdom of urging the planting of trees upon a territory whose timber lands rank sixth among the great forest countries of the world. But the school authorities saw in it a means for accomplishing a much-needed service, and Arbor Day became an annual feature of the public school calendar. Three of these days have already been observed, and a fourth will be celebrated before November, 1910.

The need of a campaign for setting out economic and ornamental plants became evident when the plans for the observance of the day were published. Attention was called to the almost denuded condition of some of the smaller islands; to the unsightly, treeless plazas of so many towns; to the cheerless, uninviting aspect of a schoolhouse without vegetation, and of a town whose vegetable life consists chiefly of weeds. The plans for Arbor Day are to introduce into these treeless spots the proper amount of vegetation—trees, vines, and gardens—and to stimulate the planting of such economic and decorative trees as will be required to complete a horticultural system which is to-day luxuriant only in some branches, and in others very poor.

In many parts of the United States, and in some provinces of the Philippines, it is now the custom to give consideration to birds on Arbor Day. The Philippine Society for the Prevention of Cruelty to Animals has asked the aid of the schools in disseminating its teachings, and it has been decided that Arbor Day can most fittingly recognize the services of both birds and trees to mankind and to each other, the one providing a home and shelter, the other crusading against the abundant insect and grub life of the Islands.

ARBOR DAY CIRCULAR IN OCCIDENTAL NEGROS.

For the school year 1909–10, Arbor Day was celebrated on the first Saturday of August in some divisions, and on the first Saturday of October in others, the day being chosen with a view to the most suitable time for tree planting. It was observed in all divisions, in some of them with marked enthusiasm and notable results in the actual planting of trees. Following instructions from the general office, division superintendents sent out circular letters containing the announcement and instructions as to the manner in which the day should be observed. Some of these circulars, particularly that for the division of Occidental Negros, contained many valuable suggestions on the purpose of Arbor Day and the proper manner of recognizing it. Excerpts of interest from this circular follow:

Arbor Day should be a day of the very greatest importance, in fact the most important of our school holidays. The students can be taught to love nature and to realize the importance of their present work to posterity. But above all it is a day upon which a work of great economic value may be inaugurated.

Trees, shurbs, vines, and plants of all kinds should be planted upon the school grounds, upon the public plazas, along the public roads, at the homes of the students, and by every citizen. Supervisors and teachers are earnestly requested to make every effort to realize the great possibilities of the day.

You will instruct students and teachers in the economic and esthetic importance of tree planting. There should be two purposes actuating the work—one the planting for economic purposes, the other the setting out of such plants as will beautify the homes and public places. Many trees and plants serve both purposes. Coconuts, sugar cane, oranges, papayas, abacá, and scores of others are primarily economic plants. Upon Arbor Day there should be at least as many such plants put out in each town as there are inhabitants in that town. This is but a small estimate, and many times that number can easily be planted. But, taking this as a basis, it is easy to see that it means a great addition to the wealth of each town. Take the yearly planting upon Arbor Day of several thousand coconut trees in each town and consider the increase in wealth in the years to come.

There is scarcely a home which might not be made prettier by growing vines and flowers about the house and bordering the walks with them, by having some large shade trees nearby, and well laid out flower and vegetable gardens. The public streets should be improved and beautified by planting shade trees and hedges.

The public plaza is often the most unsightly part of the town. You may well take steps to convert these plazas into parks. It is suggested that you take up this matter with the municipal officials, secure their coöperation in a plan for the improvement of the plaza, and assist in laying out the walks, in planting shade trees and ornamental shrubs. It is believed that such a movement once properly started would meet

with the active support of everyone. The roads leading to barrios and between barrios should be marked out, perhaps by the municipal police, and the owners of abutting lands induced to plant at regular intervals coconut or other trees which will not only beautify the road and make it shady, but also yield an income.

The acquiring of a large school site in connection with each school demands our serious consideration. The nursery and school garden should be permanent, and, in addition to having enough land for these, there should be a tract of such extent that when planted to economic plants it will yield a substantial income for the support of the school. These sites should serve as experiment stations and small demonstration farms. Seeds and plants could be furnished for distribution. Land values are advancing each year, and it is urgent that the necessary lands be secured without delay. It is believed that there are many public-spirited citizens in this province who would donate land for this purpose, and that in other cases the people will jointly purchase sufficient land.

All work in connection with the permanent improvement of the school site should be definitely planned so that each tree and shrub will be planted in accordance with a plan to be finally accomplished at some future time. There should be a plan of each school ground showing the location of each proposed building, each walk, each tree, vine, and shrub, each flower and vegetable garden, the nursery, and the playground. This plan should be submitted to the officials, the school board, and prominent citizens for discussion and for their opinion. It should be posted in the schoolhouse and in the municipal building. Every person in the town should be interested in the work to be accomplished. Every person, whether he realizes it or not, is highly concerned in the public schools.

In the celebration of Arbor Day no school is to be excused. No excuses will be accepted. If the school has no school ground, you will have a program in the schoolhouse and the pupils will plant trees at their homes and along the highways. In fact the planting of trees at the school ground will be but a small part of the day's celebration. The great work will be the tree planting by the people at their homes, through the agency of the schools. Do not refrain from planting trees for fear that they will be destroyed. Trees planted must be cared for and protected. Where trees are planted on uninclosed lands, a strong fence must be built around each tree to protect it. Student committees should be appointed to look after the work done on Arbor Day. The teacher must see that the committee does the work to which it is assigned. Municipal officials are responsible for all municipal property, including school property. With their help, and that of the students living near by, the fences may be kept in repair at all times of the year and trees properly protected.

In order to secure the best results, you must begin early to make all necessary preparations for the celebration of the day. Arrange nurseries where trees and shrub will be grown and ready for transplanting on Arbor Day. A large quantity of plants should be available for distribution not only to the pupils but also to the people of the community. Experiments will have to be made and instruction given in cutting, in transplanting, in the preparation of the soil, in caring for and protecting the plants when set out.

ARBOR DAY PROGRAMS.

A bulletin on School and Home Gardening, just published by the Bureau of Education, contains some excellent instructions on the proper methods for starting a nursery, the planting of the seed, the transplanting of the young tree, and the attention it requires until it is able to take care of itself.

The observance of Arbor Day took different forms in various divisions. In nearly all, the planting of trees was preceded by a literary and song program for central schools and for most of the barrio schools, with speeches by prominent citizens, teachers, and pupils, on the nature of Arbor Day and the value of trees. Civic processions with floats, and dances often accompanied such programs. In some cases the enthusiasm reached the point of making the ceremony a great fiesta and gala day.

One of the most interesting reports on the municipal observance of this day was submitted by the supervising teacher of Malaboyoc, Cebu. Arbor Day the year before had not been confined to the schools alone, but had been made popular. The people were filled with enthusiasm, and planting continued long after the celebration and began again long before the date set for the following Arbor Day; it was really an arbor year. When the day for the next observance arrived thousands of trees had already been planted and were growing; the work was done and the people from all over the district, *principales* and laborers, assembled in the central towns to celebrate what they had accomplished. Processions, literary programs, and the planting of some further thousands of trees made the day a memorable one for every town and barrio of the district. Nearly 150,000 trees—fruit, shade, and decorative—were planted as a direct result of the inspirations of that day. The economic and esthetic value of what has already been accopmlished in that district, along with the impetus given to such systematic planting, may be taken as a criterion for what Arbor Day can do in the Philippine Islands.

It can not be estimated how many trees were planted in the Islands as a result of this day—certainly a figure in the millions. The greater number of these were fruit trees—coconuts, mangos, chicos, guavas, oranges and lemons, jack-fruit, coffee and cacao, with a large number of papayas and bananas. For shade and decoration, such trees as the acacia, the rain tree, the fire tree, and the "caballero" were planted. There was also a large planting of the cotton tree (kapok), hemp, and maguey, also many

smaller shrubs and herbs. Decorative gardening received attention, and whole plots of flowering plants and vines were set out in some places.

DUTIES FOLLOWING THE CELEBRATION OF ARBOR DAY.

But the least part of the duties of Arbor Day are met in its celebration; the future of these hundreds of thousands of plants is to be decided by those who gave them their start. The young tree has enemies in the drought, the sun, insects, and animals, and if left to itself, it will seldom survive. This fact has been brought forcibly to mind by the results noticed in former observances; it was always very easy to compile gratifying figures on the number of trees planted, but a counting to show how many survived the first few months, or even the first few weeks, was very discouraging. The enthusiasm of the teachers and pupils died, and with it the trees. The plans of to-day aim at the planting of desirable trees, and, above all, the proper care of the planted, though it be only a single tree, till it gets a good start and is able to care for itself.

Such was the aim of the last Arbor Day. The proper time for planting was chosen; strong fences of stakes were prepared beforehand and placed firmly around each plant, unless inclosed by a garden fence; pupils were instructed to water the plants when necessary. In some instances it was made a part of the work of teachers and pupils to have these trees survive, and to substitute a new plant when the original could not be preserved.

It was a campaign of conservative, systematic planting, to introduce into needy spots a few selected trees which would survive, rather than a great number with only indifferent results. Trees were planted, following out definite plans in municipal plazas and in school yards. In some cases the coöperation of property owners was secured, and pupils and people united their efforts to line the public roads and streets at regular intervals with trees. Where school grounds and plazas were not in need of such improvement, pupils planted economic trees at their homes or in their fields. School yards and homes were decorated with garden plants and vines. Sometimes the effort was directed toward giving wider distribution to some variety of tree which may have been confined to only a small locality, as is often the case in the Philippines.

BENEFITS TO THE PEOPLE AND THE COUNTRY.

Arbor Day has served already to awaken among the people a new interest in planting. In many places thousands of coconut and hemp plants have been set out as a direct influence of the

celebration of Arbor Day. The enthusiasm of a successful Arbor Day carries over throughout the year and becomes a planting habit.

It is a movement to lead the people, through the schools, to a general observance of the day, to encourage the wider distribution of desirable varieties of plants and trees now often narrowly localized, to introduce new species of value, and finally, to diffuse among the common folk ideas of utility and good taste in tree planting. During the arbor season, the Bureau of Education enlists its entire school force in planting, and directs it along lines dictated by those who have studied and best understand Philippine conditions; it stimulates interest along these lines by the publication of bulletins and by Arbor Day celebrations; it makes tree raising a part of the school work, using school gardens for seed beds and nurseries, distributing their products gratis among the people. It creates an enthusiasm which produces practical results, and puts an end to careless destruction; the pupil who has with exceeding care caused one tree to grow up and flourish will not wantonly destroy another. He feels the responsibility of ownership for that tree, and an interest in all living things. Arbor Day has become a really important factor in the school life as well as the home life of the Filipino people, and its possibilities are being more fully realized each year.

FIBER PRODUCTION IN THE PHILIPPINES.

By M. M. Saleeby, *Fiber Expert.*

The production of abacá has been gradually increasing for the last six years, and it is calculated that this year's production will even exceed that of last year. The causes for the earlier increase of production are not the same as those that made for the late increase. Investigation reveals that the increased production during the past two years has not been the result of a general improvement of the plantations or large plantings, as was the case in former years. The real cause, as far as can be learned, is the general practice of the ruinous method of overcropping, in the adoption of which the planters are actuated by the desire for present profits, totally disregarding the future. This increase is, therefore, a most unhealthy one, and, sooner or later, the production of abacá will take its downward trend. Already quite a number of abacá fields in the various districts are practically exhausted and other crops are being raised on them. In this connection it may be argued that the tendency to raise other crops on the land now cultivated with abacá is in accordance with the law of the adjustment of supply and demand and will ultimately result in reducing the supply and raising the price. This would be the natural outcome if the abacá plantation of to-day were managed in a way that would put it in a condition to reap the expected profits when such a rise in the price occurred. But the lack of proper cultivation and the careless method of extracting the fiber will only tend to strengthen the position of all competing fibers and reduce the demand for abacá; besides, granting that in a few years from now the price will come up, from the way the plantations are managed at present, very few planters will be in a position to reap the full advantage of the high prices.

Overproduction has been given as the chief cause that led to the recent decline in the price of abacá. While overproduction of any commodity must necessarily result in lowering its price, yet it is highly improbable that it will cause such a sudden and considerable drop in the price of a commodity that possesses

such a variety of uses as abacá. It is believed it is principally overproduction of inferior fiber that has led to the present condition of the industry. The use of coarse and dark fiber, such as is produced in most of the abacá districts, is restricted to the manufacture of ropes of various kinds and sizes only, while better grades of fiber have a multiplicity of uses. Consequently, there may occur overproduction of inferior fiber, but overproduction of superior fiber can hardly be possible. The consumers have repeatedly complained of the quality of fiber shipped from the Islands, and we can hardly expect them to continue paying a high price for it, especially when they can resort to the use of other fibers, such as sisal, English hemp, etc.

Of all the provinces visited by the fiber expert during the year, Albay produces the lowest grade of fiber. This has a very bad influence on the market, as about one-third of the total fiber produced comes from this province. In most of the remaining provinces, also, the quality of the fiber has declined. The principal localities where the production of a superior fiber is still practiced are northern Samar, southeastern Mindanao, western Leyte, and the eastern part of Sorsogon.

The following is an extract from the Report of the Manila Chamber of Commerce for the year 1909, showing the production of abacá by provinces for the last ten years:

Manila hemp statistics—receipts, 1900–1909.

[Piculs.]

Provinces.	1900	1901	1902	1903	1904
Albay	486,123	547,096	545,941	527,171	591,354
Leyte	254,540	259,803	170,401	289,802	241,462
Sorsogón	235,565	190,764	172,640	281,957	210,878
Samar	135,989	18,804	258,478	165,605	121,551
Camarines	161,062	158,876	86,706	182,835	162,736
Mindanao	147,076	81,910	68,706	33,940	42,574
Other districts	116,605	96,173	131,241	212,055	132,671
Total at Manila	1,536,960	1,353,426	1,434,390	1,693,365	1,503,225
Total at Cebú	343,192	192,720	364,666	314,727	306,048
Grand total	1,880,152	1,546,146	1,799,056	2,008,092	1,809,273

Provinces.	1905	1906	1907	1908	1909
Albay	521,658	406,038	479,879	548,194	546,703
Leyte	246,016	266,100	349,245	318,059	295,690
Sorsogón	212,184	157,072	231,912	198,786	225,385
Samar	106,464	93,788	166,420	179,283	180,577
Camarines	173,108	147,390	132,364	144,594	151,864
Mindanao	51,210	55,320	74,816	93,742	148,394
Other districts	148,962	86,180	79,782	72,246	148,354
Total at Manila	1,459,602	1,211,888	1,514,418	1,554,904	1,896,967
Total at Cebú	350,556	312,854	428,698	549,350	659,832
Grand total	1,810,158	1,524,742	1,943,116	2,104,254	2,556,799

The price paid for abacá (Manila hemp) in the United States and European markets during the period from 1900 to 1909 has varied considerably. The following, which is an extract from Messrs. Landauer & Co.'s Hemp Statistics for 1909, will serve to show the range of price per picul (137.5 pounds) paid for fair current during the above period, in the London market:

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
	Pesos.	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Highest	41.90	30.00	30.60	25.00	25.60	26.50	27.00	27.00	19.00	17.00
Lowest	18.00	18.40	23.25	21.60	21.60	22.80	25.50	18.00	12.80	12.30
Average	29.95	24.20	26.90	23.30	23.60	24.65	26.25	22.50	15.90	14.60

EXPORTS FROM THE PRINCIPAL COPRA-PRODUCING COUNTRIES IN THE FAR EAST.

1900 TO 1909.

[From the report of the Manila Chamber of Commerce, for the year 1909.]

Year.	Java.	Macassar.	Sangir, Menado, and Rontalo.	Pandang.	Singapore and Penang.	Ceylon.	Manila.	Total.	Percentage Philippine exports of total.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Per cent.*
1900	35,257	13,982	10,296	5,487	28,214	18,059	57,361	168,656	34
1901	27,688	12,151	10,482	4,737	26,111	21,916	28,854	131,939	22
1902	45,129	28,045	17,698	5,364	50,490	18,740	45,030	210,496	21
1903	15,406	9,799	11,653	6,231	52,420	34,713	78,874	209,096	38
1904	29,716	9,125	11,746	6,120	42,070	33,578	38,383	170,738	22
1905	107,709	25,961	19,514	6,580	58,915	17,740	49,715	286,134	17
1906	52,000	9,641	14,481	6,638	39,215	21,212	57,900	201,087	28
1907	69,666	17,248	16,080	8,694	55,120	16,898	53,531	237,237	23
1908	94,740	21,591	12,047	11,927	76,550	36,457	89,698	355,010	25
1909	68,217	19,256	20,706	9,390	71,105	34,520	103,669	354,889	29
Grand total							603,015	2,325,282	26

EXPORTS OF LEAF TOBACCO FROM THE PHILIPPINES.

1900 TO 1909.

[From the report of the Manila Chamber of Commerce for 1909.]

[Quintals.]

Countries.	1900	1901	1902	1903	1904
Great Britain	338	2,042	4,412	10,140	7,668
United States		53	1,138	88	
Continent of Europe	185,013	169,770	179,432	170,642	154,376
China, etc	3,017	5,678	4,384	3,129	3,745
Total	189,368	177,513	189,366	183,999	165,798

Countries.	1905	1906	1907	1908	1909
Great Britain	2,337	11,874	14,224	863	1,126
United States		1,310			124
Continent of Europe	154,371	241,210	195,200	217,432	197,771
China, etc	5,236	22,647	12,660	6,329	8,265
Total	161,944	277,041	222,084	224,624	207,286

CURRENT NOTES.

AGRICULTURAL CONDITIONS IN PANAY AND NEGROS.

According to the Iloilo Enterprise of July 27, Governor Ruperto Montinola, in speaking of his recent trip through the central part of the Province of Iloilo, states that the municipalities of Cabatuan, Janiuay, Pototan, Barotac Nuevo, and Dingle, which have recently been infested with immense swarms of locusts are now almost entirely free from them, due to the vigorous and continued campaign carried on by the officials and the people. It is reported that new swarms of locusts are coming into the province from the mountains, also from Capiz Province.

Governor Montinola states that rinderpest has been practically stamped out of the whole province, and the present telephone service which gives a means of communication with almost every town in the province enables the veterinarians to take quick action whenever there is any indication of an outbreak of animal disease. The *hacenderos* continue to purchase farm animals from the importers, who are bringing in large shipments from Indo-China.

It is estimated that as a result of the damage done by the locusts, and the long-continued drought, the first rice crop in this section will not be more than one-third of the average crop. However, the corn crop is reported as doing very well. According to Acting Collector of Customs C. C. Crick, of Iloilo, there is an extraordinarily large crop of sugar cane growing in these two islands. In some parts of Iloilo Province the crop is approximately double that of past years, and reports from Negros show that the farmers are assured of a very large yield.

Panay and Negros seem to have been most affected by the dry weather, and it is claimed that up to August 1 some sections of these islands had less rain during June and July, than during the dry season. In many parts of Occidental Negros the planters have not prepared a single hectare of ground for transplanting their rice from the seeds beds.

The work on the Panay division of the Philippine Railway is being pushed with vigor, and the company expects to have the entire line completed within a few weeks. This railroad, which

intersects two of the richest sections on the Island of Panay, namely, the Panay River Valley and the rich agricultural lands in Halawur Valley in Iloilo Province, will be a great help to the farmers by furnishing them the very best means for transportation and communication.

THE CAGAYAN TOBACCO CROP.

According to a report from Tuguegarao, dated July 22, and published in The Cablenews-American, in March and April when the lower leaves on the tobacco plants were being gathered a series of showers began falling which have produced a new crop of leaves at the top of the tobacco plants. Experts say that these leaves are better than the first ones, that they are freer from worms, and that their texture is finer and more like rubber. It is believed that some of this second crop of leaves can be used for wrapper tobacco.

In some places it is stated that quite a lot of tobacco was left standing in the fields, which the owners claim they have no place to store, and that they can not iron out the leaves which they have already harvested. According to this report there are not enough people, including men, women, and children, to handle the tobacco crop after it has been harvested. It is also stated that the corn crop is in excellent condition; however, but little corn was planted this year. Most of the farmers were so enthusiastic over the results of the Payne Bill, that they decided to plant as much of their land as possible to tobacco, and in consequence corn is very scarce in this section, in some places selling as high as ₱5 a cavan. Some of the people load their pack animals with bejuco, coconuts, and such other things as they have to sell, and send them as far as 20 miles to exchange them for corn.

The new launch lines which have been started on the Cagayan River are doing excellent service, carrying both freight and passengers at reasonable rates.

PROVINCIAL NOTES.

Abra.—The subprovince of Abra, lying between the Province of Ilocos Sur on the west and the fertile valley of the Cagayan on the east, has a total area of 303,289 hectares, of which 52,086 are suitable for agricultural purposes; however, only 12,208 hectares are under cultivation. While corn and tobacco are the principal crops, considerable rice and sugar cane are produced.

Topographically speaking, the province is made up of the Abra River Valley and a series of small valleys leading into it,

which are surrounded by hills and mountains, some of them nearly 4,000 feet high. It is in the Abra River Valley and its tributaries that the agricultural interests of the province are found. Unlike the planters in most provinces, the farmers of Abra rarely use the mountain sides for planting, preferring to utilize them as pasture lands for goats, cattle, carabaos, and horses. As a large part of the province is inhabited by non-Christian tribes, who live in the mountains and plant only enough for home consumption, practically all of the farming on an extensive scale is done within 25 kilometers of Bangued, the capital of the subprovince.

In traveling over the province, one is impressed with the evidence of its past thrift and prosperity. However, with the exception of Bangued and its immediate vicinity, there are no wagon roads in the province and transportation between different towns is by means of "cargadores," carabao sleds, or horses, over trails which in some places are difficult to find.

Corn is probably the most important crop grown in the province. Two crops are grown nearly every year, the first being harvested in February and March, and the second in June and July. The total yield for the past year approximated 30,000 hectoliters, about half of which is exported. At harvest time the corn is pulled, divided according to the size of the ears into three grades, and tied in bunches of ten ears each. The first grade is sold for about ₱3, the second grade for ₱2.80, and the third grade for ₱2.50 per thousand ears. Since the Bureau of Agriculture has been buying corn in Abra more of it is being planted. Several of the farmers are planting the "Mexican June" variety, which was furnished to them by the Bureau. This variety seems to be doing very well, and the prospects for a good crop are decidedly encouraging.

Rice, sugar, and tobacco do well in the province. Coffee is grown in some of the towns situated in the mountains, and considerable cacao is grown near the municipality of Bucay. In San José a species of muskmelon is found, although it is not as sweet as those grown in temperate climates. Maguey grows wild along the trails near Bangued, and "kapok" is found in practically all inhabited portions of the province.

Fully one-fourth of the families of Abra own a loom of their own, on which a coarse grade of cloth (Ilocano cloth) is woven. The yarn for these cloths is bought from Chinamen and dyed in various colors by members of the family before they are woven.

In Abra practically every farmer is a stock raiser, and they all have one or two brood mares and two or three female carabaos for breeding. The horses are larger and have better conformation, stronger and cleaner bones than those found further south. Most of them are fed corn, which forms about one-third of their daily ration. As a consequence, these animals have a stronger constitution and greater endurance than the horses in the southern parts of Luzon, where they are fed only grass and "palay." It is also believed that the climatic conditions of this province are more favorable for horse raising. (Report of S. H. Sherard, agricultural inspector, Bangued.)

Pampanga.—There have been heavy rains in Pampanga which have made the roads almost impassable. On account of the lack of rain during the earlier part of the season the rice crop of Pampanga is late, and in many places the seedlings have not been transplanted to the fields. The sugar crop, however, is in good condition. (Report of W. A. Curtis, veterinarian, San Fernando.)

Batangas.—A recent report from Mr. Lee Rogers, of Batangas, states that thus far during the rainy season it has been exceedingly dry, and unless the rains set in before the middle of August the rice crop will be considerably damaged. He states that the country in the mountains around Batangas has not suffered so much as the lowlands. A good crop of corn has been harvested this season, but vegetables and fruits of all kinds are very scarce on account of the drought.

Cattle disease has been practically stamped out and now that the quarantine has been taken off everyone is turning to with a will and the prospects for better times for the farmers of the province are decidedly encouraging. Mr. Rogers is interested in the poultry business, in which he has been very successful.

Albay.—An effort is being made by the schools to introduce silk culture as an industry in Albay Province. During the long vacation Mr. Pablo Nación, teacher of agriculture in the provincial school, took a course in silk culture at the Bureau of Science Laboratory in Manila and will give a course in this work at the provincial school as soon as the necessary equipment is secured and a sufficient number of mulberry trees have reached the size necessary to produce leaves in large quantities. About 2,000 mulberry cuttings are on hand and will be distributed to those who send their requisitions to Mr. Nacion or to the division superintendent of schools. The plants should be set out from $2\frac{1}{2}$ to 3 meters apart each way. Each central school should set out from 20 to 30 plants, and a small number should be sent to each

barrio to furnish leaves for experiments and cuttings for future distribution. Attention is invited to the article on "Silk Culture in the Philippines" in the March (1910) number of THE PHILIPPINE AGRICULTURAL REVIEW, also to the article in the June (1908) number. Farmers' Bulletin No. 163 (Silkworm Culture) may be obtained by writing to the Secretary of Agriculture, Washington, D. C.

Roots of the valuable forage plant, guinea grass, will be distributed free upon application to Mr. Nacion or to the division superintendent of schools. This grass is easily propagated by subdividing the roots.

Acacia seeds may be secured from the division superintendent of schools.

Iloilo.—The crops in Iloilo have been kept back on account of the lateness of the rainy season. Seed beds for rice were planted during the early part of July; however, but little rice has been transplanted, as few of the fields have been prepared on account of the lack of rain.

Corn and sugar cane are looking well, and rice, which is the only crop in Capiz Province, is nearly all planted and in good condition. The dry season still continues, and unless the rains set in before the end of August the rice crop will suffer considerably.

Owing to the activity of Governor Montinola, most of the locusts in the lowlands have been killed and comparatively little damage has been done by them to the growing crops. (Report of J. A. Thompson, veterinarian, Iloilo, August 1.)

NOTES FROM OTHER FIELDS.

COFFEE CULTURE IN GUATEMALA.

According to an article in Tropical Life for June, by Mr. Gustav Helmrich, coffee cultivation is at present the most important industry in Guatemala. Mr. Helmrich is a coffee planter of fifteen years' experience in Alta, Verapaz, Guatemala, and is considered an authority on this subject.

The plantations in Guatemala are situated about a thousand meters above sea level, where the climate is excellent.

Coffee culture was commenced in Guatemala about sixty years ago, but in all this time little attention has been paid to finding the most suitable varieties or to careful selection of seed. *Coffea arabica,* and Java, Bourbon, and Liberian coffees have all been planted, but have not proved to be the best varieties. The Maragogipe coffee from Brazil has been planted very much during the last ten years, and "has gradually acquired the properties of Guatemala coffee—*i. e.,* smooth appearance, good color and aroma—of course, at the expense of the originally abnormal size of the beans. This fact, however, is significant and gratifying inasmuch as Guatemala is devoting itself to the cultivating of a new variety, which may result in a grafted species for the whole of central America."

Virgin or forest land is usually selected for a coffee plantation, on account of the large amount of humus such soil contains. Mr. Helmrich suggests, however, that this amount of humus could be supplied artficially by planting leguminous crops and plowing them under, after an application of 5 hundredweight (226.8 kilograms) of basic slag and 3 hundreweight (136.08 kilograms) of muriate of potash per acre (0.4 hectares).

The trees are started in nurseries, and in planting them out the space alloted to each tree is about 3 meters square. The field is cleared from weeds before planting begins and the weeds and loose soil are heaped up in rows, thus affording some protection to the young trees. Planting takes place when there is plenty of moisture present in the ground, or when dull weather is expected. The weeds are either buried in holes dug between

every four trees or made into a compost with the loose earth and spread around the stems. The dry season is the pruning period.

Guatemala coffee varies in color from dark green to blue, and, unlike much of the Brazilian coffee, is washed before it is put on the market. Only pure water should be used for this purpose, as it has been noted that after treatment with water containing iron, the coffee has a somewhat acid taste. It is estimated that 100 kilograms of coffee fruits will yield 18.22 kilograms of marketable coffee.

COPRA AND SUGAR IN JAVA.

Under the heading "Consular Reports" in the "West India Committee Circular" for June 21, 1910, we find the following note on copra and sugar in Java:

The exports of copra from Java in 1909 were considerably smaller than those of the preceding year, and crop prospects for 1910 are not considered favorable. The question of quality has of late been receiving the earnest attention of shippers of this article, and efforts are being made to raise the standard which has during the past few years gradually become lower. Carelessness in preparation and indiscriminate plucking of immature nuts are the causes of deterioration. Exports for 1907, 1908, and 1909 were 68,000 tons, 94,976 tons, and 72,000 tons, respectively.

On account of the good out-turn of the sugar crop in recent years the mills are endeavoring to increase their plantations, and many have already reached the maximum which is permitted by government. Improved methods of cultivation and experience of the fertilizers best suited for the various soils have enabled planters to make use of ground which was formerly considered unfit for sugar cane. A matter which has in recent years had the increasing attention of planters is the steady advance in the rent which has to be paid to the natives for the hire of their fields. This is due not only to competition among planters, but also to the stronger financial position of the natives in many districts. According to the most recent returns the area planted for 1910 is about 2.7 per cent more than in 1909. The cane has in many instances been planted during wet weather, and has suffered in east Java from a period of drought during the latter part of the year, but if only seasonable weather be experienced in the early months of 1910 there should be no cause for alarm at the prospects for the 1910 crop, the greater part of which has already been sold at very good prices.

EXPORTS OF HAVANA CIGARS TO THE UNITED STATES.

"Tobacco," for May 19, 1910, publishes the exportation of cigars from Cuba during the last half of April, as shown in the custom-house records. The shipment of cigars was much heavier for these two weeks than for the corresponding period last year, but on the whole, from January to April the shipments in 1910 have been more than 8,000,000 cigars short of the amount shipped during the same period in 1909. The total shipment

of cigars from Cuba from January 1 to April 30, 1909, was 61,578,249, while for the same months this year it has been 53,299,219 cigars.

TOBACCO EXTRACT.

Consul-General Robert P. Skinner, of Hamburg, discusses in the Monthly Consular and Trade Reports for March, 1910, the demand in Germany for tobacco extract, and tells something of its preparation and uses. As this is a subject upon which very little has been published, we are quoting his statements here, for the benefit of Philippine agriculturists who may be interested.

"Tobacco extract is obtained," states Mr. Skinner, "by the treatment of strong varieties of leaf tobacco, such as are harvested in Kentucky and Virginia, with hot water and lye. Kentucky tobacco is said to contain a higher percentage of nicotine than any other, frequently as much as 12 and 13 per cent, and such varieties are, therefore, regarded here as unfit for direct consumption, and fit for the manufacture of cigars only when mixed with a proper proportion of very light tobacco. Thus the Austrian monopoly manufactures what are called Virginia cigars, in which the proportion of nicotine is reduced to 8 per cent by the withdrawal from the natural leaf of from 2 to 4 per cent. All grades of tobacco with a high content of nicotine are valuable for the manufacture of the extract, which is obtained by cooking the leaves in hot water and in combination with lye. The extract is produced with difficulty, as pure nicotine volatilizes easily and must be accumulated in a vacuum.

"Tobacco extract appears to have a variety of uses. It is used most generally as a 'sheep dip,' being valuable for destroying ticks which bury themselves in the skin of the sheep and damage the fleece. Then, too, it is an excellent insecticide, and 'plant pests of various species which pursue their work of destruction both above and under the soil have been successfully combated with a solution of 1 to 400 parts of water, the dose varying according to the nature of the plants treated.' The most delicate of flowering plants appear to suffer no harm whatever from its use. Another use, very common in Germany, is the dosing of chewing tobacco, to increase the amount of nicotine.

"In 1908 the United States exported 551 tons of tobacco extract to Germany, at a value of $140,132 (₱280,264), and it is estimated that 1909 would show an increase to 650 tons, 'with excellent prospects for the future.' "

THE EXHIBITION OF AGRICULTURE AND COMMERCE OF SIAM.

On the 18 of last April the First Annual Exhibition of Agriculture and Commerce in Siam was inaugurated in Bangkok by His Majesty King Chulalongkorn. Consul-General G. Cornell Tarler has kindly furnished us a very interesting account of the exhibition, from which we quote the following:

The formal opening was attended by the crown prince, members of the royal family, government officials, and the diplomatic corps. The exhibition grounds were reached by crossing bridges built over the canals surrounding the grounds, and the exhibits were housed in prettily decorated buildings. Two years ago this was merely a rice exhibition, but, due to the efforts of the ministry of agriculture, its scope was widened to include all that the present exhibition contained.

In addition to the numerous paddy exhibits, was a model farm showing paddy fields and rice under cultivation, and the methods of irrigating and fertilizing them. Here also was shown a steel plow (American) drawn by a buffalo, to be used in the dry season. A pineapple plantation under cultivation was shown also, and ninety different varieties of grass growing in the rice fields.

The results of experiments conducted with tobacco were shown, and Siamese, Sumatra, and Havana plants were exhibited. None of the leaf had been fermented, but sun cured, and it was manufactured into cigars and pipe tobacco.

Samples of cotton raised here were also on view.

The department of mines had a metallurgical exhibit showing tin in various stages, sapphires, rubies, gold quartz, limestone, nickel ore, jaspar, agate, and porphyry; also some crude petroleum found in the peninsula near the coast.

Considerable space was devoted to the sericulture department, which has grown to be quite an industry. Native looms were shown, and numerous specimens of the finished silk.

The irrigation department exhibited models of schemes for irrigation, and the proposed waterworks for Bangkok.

European and American thrashing machines, centrifugal pumps, electrical apparatus, motors and marine engines, files, rice mills, and other machinery were shown.

The native soap products were exhibited, as also the furniture made by the prisoners in the Bangkok jails.

A local firm exhibited artificial ice and dispensed its artesian water and ice cream.

There were also exhibits of fruit, horses, cattle, and poultry.

The agricultural college was awarded medals for tobacco, vegetables, and the model farm.

The exhibition lasted about two weeks, and was a great success, having been attended daily and nightly by huge crowds.

NOTES ON MANILA MARKETS FOR JULY.

By KER & Co.

Based on advices

From—	Date.	From—	Date.
London	July 5	Hongkong	July 28
San Francisco	July 6	Iloilo	July 28
Singapore	July 21	Cebu	July 29

SUGAR.

Manila.—Nothing new to report.

Iloilo.—Very little business has been done since our last report and the market closes quiet. For parcels containing 50 per cent of Nos. 1 and 2 we quote ₱8.50 per picul [1] bases assorted.

Cebu.—Nothing new to report.

HEMP.

The market has been dull and the prices of lower grades have declined. We quote fair current (Albay quality) at ₱8.75 per picul. Receipts of the finer qualities have not increased to any extent, and all arrivals have met with a ready sale at former prices. Errors have been discovered in the receipts from January to June amounting to 24,983 bales, and the corrected total for the six months is now 694,453 bales. Receipts at all ports for the seven months were 801,487 bales against 731,734 bales for the corresponding period of 1909 and 562,606 in 1908.

COPRA.

Owing to better advices from Europe our market has been very firm throughout the fortnight with higher prices ruling. For fair merchantable quality we quote ₱11 per picul.

[1] 1 picul=63¼ kilograms.

DISTRIBUTION PRINCIPAL PHILIPPINE EXPORTS.

Distribution of principal Philippine exports for the seven months (January to July, 1910).

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Federated Malay States and India.
Dry sugar ..... tons	55,490	13,998	12,932					
Hemp ..... bales	348,727	9,208	31,791	291,823	36,616	11,384	10,212	5,935
Copra ..... piculs			43,104	12,800	785,248			
Cigars ..... thousands	32,521	22,315	20,367		11,183			

ILOILO SUGAR MARKET.

By FIGUERAS HERMANOS.

JULY.

The amount of sugar received from the mills and sugar districts during the month amounted to 42,265 piculs, of which one-half was firsts and seconds mixed, and one-half thirds. The sugar market opened on the first day of the month at 8 pesos and 1 real [1] and rose to 8 pesos and 3 reales on the 2d. This price continued until the 7th, when the market again went up to 8 pesos and 4 reales, which was quoted until the 16th; on this date the price again dropped to 8 pesos and 3 reales, which was paid until the 23d, when a quotation of 8 pesos and 4 reales was made and continued until the end of the month.

July shipments.

Date.	Vessel.	Destination.	Superior, (piculs).
July 8	Jura	New York	80,000
July 9	Inverclyde	do	48,000
July 11	Vandalia	do	54,400
July 12	Tringganu	Singapore	4,000
July 14	Indrasamha	United States	24,000
July 14	Hangchow	Ningpo	8,182
July 28	Louthers Castle	United States	95,200
Total for July			313,782

Exports up to July 31, 1910.

[In piculs.]

To—	1908–9 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	235,600		889,600	
Japan	50,667	8,915		
China	682,095		72,757	486
Total	968,362	8,915	962,357	486

[1] 1 real = 12½ centavos.

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

JULY, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	26.0	------	26.1	1.3	26.0	------	27.0	3.1	27.8	------	28.9	------
2	25.6	23.3	26.2	5.8	26.2	------	27.0	6.9	28.1	------	28.4	------
3	26.3	12.7	27.0	1.5	27.6	------	27.7	------	28.1	------	28.2	33.0
4	26.8	12.7	27.6	------	27.5	------	28.0	------	26.6	------	28.8	1.5
5	27.2	------	27.5	24.4	27.0	3.8	28.8	20.1	26.8	4.6	28.2	------
6	27.6	------	27.5	0.5	26.8	------	28.4	------	28.1	------	27.8	------
7	27.6	------	26.8	8.6	26.9	4.1	30.2	12.2	28.0	5.1	28.0	------
8	27.5	------	26.4	0.3	25.9	21.8	28.4	13.7	27.4	------	------	------
9	28.1	------	27.6	------	27.0	------	27.8	3.6	28.4	------	------	------
10	28.8	------	27.5	3.0	27.5	------	28.4	2.0	28.7	------	------	------
11	28.4	------	26.2	2.5	27.2	------	28.6	------	28.4	------	------	------
12	25.6	4.4	26.6	------	27.5	------	29.2	25.9	27.7	------	27.8	25.4
13	25.8	4.6	27.5	------	26.9	------	28.4	12.4	27.7	------	27.4	------
14	27.6	6.1	27.1	14.5	26.7	------	28.1	11.2	28.1	------	27.0	3.8
15	25.7	31.8	26.0	9.6	27.7	------	27.2	21.1	26.2	3.9	26.2	31.7
16	26.4	53.8	27.0	------	27.8	------	26.1	3.6	24.4	4.4	25.0	59.7
17	26.8	------	27.7	------	27.8	------	24.6	14.3	25.8	------	25.1	1.5
18	27.2	------	28.0	------	27.8	------	27.3	------	27.6	------	27.8	------
19	28.3	------	27.8	1.5	28.3	------	28.6	------	28.6	------	27.8	------
20	27.5	8.4	27.8	------	27.8	7.1	24.8	4.3	26.9	1.5	26.1	------
21	28.1	13.0	28.0	2.5	28.3	0.3	27.0	------	27.6	------	26.4	------
22	28.0	2.8	26.7	23.6	28.4	------	28.5	------	28.6	------	27.8	------
23	28.1	------	27.8	11.7	26.5	2.3	28.4	20.3	28.3	------	28.4	------
24	28.9	------	27.7	10.7	26.8	0.5	29.3	27.4	28.5	------	28.4	------
25	28.3	------	26.6	4.1	26.7	------	28.9	------	28.2	------	28.1	------
26	27.3	------	26.6	4.8	26.7	------	29.6	------	28.3	------	28.6	------
27	27.5	------	27.9	------	27.1	------	29.6	5.1	28.3	------	28.1	------
28	28.2	------	27.4	0.8	28.1	------	28.6	------	28.1	------	28.0	------
29	27.8	8.2	27.6	17.8	27.6	14.5	28.0	------	28.3	------	27.7	------
30	27.0	7.9	27.4	6.4	27.2	0.8	28.8	6.4	28.3	------	28.6	------
31	28.2	8.4	26.6	8.4	26.8	1.8	28.8	------	28.5	2.5	28.4	------

CURRENT PERIODICAL LITERATURE.

ARTICLES IN CURRENT PERIODICALS OF INTEREST TO AGRICULTURISTS IN THE PHILIPPINES.

SUGAR.

Porto Rican Sugar Matters, in *The Modern Sugar Planter,* Vol. I, No. 4, June 11, 1910. The establishment of new plants, and the general outlook for the industry.

The diseases of Sugar Cane (an address by Prof. C. W. Edgerton, plant pathologist, State Experiment Station, before the Louisiana Sugar Planters' Association, June 9, 1910), in *The Modern Sugar Planter,* Vol. I, No. 4, June 11, 1910.

The Manufacture of White Sugar in Java, by H. C. Prinsen Geerligs, in *The Modern Sugar Planter,* Vol. I, No. 7, July 2, 1910. A paper communicated to the Paris Congress, dealing with the methods in use in Java in the production of a white sugar.

The Sugar Industry of Hawaii, by Jesse H. Buffum, in *The Louisiana Planter.* A continued series of articles, beginning in March, 1910. A very detailed account of the Hawaiian sugar industry in all its aspects.

Cane Irrigation in Louisiana (read by Mr. C. C. Krumbhaar, before the Louisiana Sugar Planters' Association, June, 1910), in *The Modern Sugar Planter,* Vol. I, No. 4, June 11, 1910. An account of work accomplished in irrigation in Louisiana, especially during the past season.

Sugar Cane in Crop Diversification (no author), in *The Louisiana Planter,* Vol. XLV, No. 1, July 2, 1910. An account of the numerous and extremely profitable small cane holdings in the Southern States, which started because of the cotton boll weevil ravages. These plantations have no connection with the larger sugar manufacturing interests, but put out a sirup that sells very well.

MISCELLANEOUS.

Fighting Field and Lawn Weeds with Sprays, by H. L. Bolley, North Dakota Experiment Station, in *The Breeder's Gazette,* Vol. LVII, No. 24, June 15, 1910. Spraying on of chemicals and the action of various solutions upon different classes of plants.

Disinfection of Imported Plants in the West Indies, by H. A. Ballou, entomologist on the staff of the Imperial Department of Agriculture, in *West Indian Bulletin,* Vol. X, No. 4, 1910. Summaries of the laws in force in the West Indies at present, and directions for preparing and using insecticides and fungicides, etc. Also a bibliography of literature on the subject.

The Consumption of Cacao, in *The West Indian Committee Circular* (June 21, 1910), Vol. XXV, No. 306. An account of the increase in the production of cacao, and its distribution through the markets of the world.

Banana Disease in America and Cuba, by Drs. R. E. B. McKenny and Edwin F. Smith, published in *Science* and reprinted in *The West Indian Committee Circular,* Vol. XXV, No. 307, July 5, 1910. An account of the destructive Central American banana blight, a fungous disease which has caused much loss in Central America, Cuba, etc.

Report on Rice and Cotton Investigations in China and Japan, by F. G. Krauss, agronomist, Hawaii Agricultural Experiment Station, in *The Hawaiian Forester and Agriculturist,* Vol. VII, No. 5, May, 1910 (to be continued).

Construction and Use of Road Drag (a press bulletin of the Nebraska Experiment Station, by L. W. Chase), in *The Breeders' Gazette,* Vol. LVII, No. 26, June 29, 1910. An account of the King split-log drag, with an illustration giving dimensions.

PLATE I.—HOUSE OF SUPERINTENDENT, LAMAO EXPERIMENT STATION.

THE PHILIPPINE

Agricultural Review

VOL. III OCTOBER, 1910 No. 10

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EDITORIAL.

AGRICULTURAL EXTENSION WORK.

The remarkable development of agriculture in the United States during the past twenty years has been due, in a large measure, to the fact that the American farmer is learning to utilize the information obtained by investigators and specialists. Formerly there was a tendency on the part of the farmers to ridicule the work of the experiment station and the laboratory. It was believed that the only place to learn anything about farm-

ing was on the farm, and that the investigator was little more than a useless and valueless theorist.

It is interesting to note what the causes are that have brought about this radical change in the attitude of the farmers toward scientific investigation. There has been, naturally, more or less improvement both in the methods of investigation and in the results obtained, but that which is mainly responsible for the bringing together of the farmer and the investigator has been the improvement in the methods of furnishing information to the farmer. So long as the results obtained by experimental work were sent out only in the form of statistical tables, chemical analyses, and technical bulletins but little progress was made. It was only when capable men, thoroughly trained in their work, went to the farmers and showed them by actual demonstrations that their crops could be increased two and three fold with little or no increase in cost and labor that substantial and far reaching results were accomplished.

Agricultural extension work includes all of the different lines of work that have to do with the education of the farmer. The distribution of printed matter, farmers' institutes, coöperative demonstration work, and the organization of agricultural associations are all forms of extension work. In many cases some one particular line of work is best adapted to a certain locality, but ordinarily a combination of two or more lines of work such as lectures and the distribution of printed matter, or lectures and inspection of farms, will give the most satisfactory results. The basis of any extension work should be a thorough knowledge of existing conditions in the locality in which the work is to be done, so that the introduction of methods that are impracticable will not be attempted.

In this number of the REVIEW we are publishing an article on extension work in the Philippine Islands, which gives an outline of some of the different lines of work that are being carried on in this country.

SCHOOL GARDENS.

The increasing prominence that is being given to school garden work by the Bureau of Education is indicated by the recent issue of a bulletin, "School and Home Gardening." This bulletin is reviewed under the department of "Current Notes" in this number of the REVIEW.

The school garden, when carefully planned and efficiently supervised, can be made an important factor in the work of

bringing the people as a whole to adopt more satisfactory agricultural methods. A good school garden in a municipality or barrio serves the purpose of a small demonstration farm where not only the pupils in the school, but also all of the people in that locality can see the results obtained by improved methods of work.

By means of the school gardens the children in the schools are given an opportunity to apply in a practical and convincing way the knowledge they have gained in the class room. They learn that careful planting and attention given at the proper time to the growing crop will bring good results, while indifference to these essentials will surely result in failure. They learn of new and improved food plants which they can and do raise successfully. They learn from their own personal experience that success in raising plants is the result of well-directed effort, not of chance or providence. It is this kind of training, carried on year after year, that must of necessity change the attitude of the people and make them ready to receive and make intelligent use of new and practical suggestions. Whether or not the individual students stay long in the schools, the work is going on among them and the atmosphere is felt. The old idea that it is degrading to work with one's hands can not continue indefinitely when thousands of young people are daily being trained to believe that one of the most honorable and useful things in the world is to work with one's hands in a good cause.

AGRICULTURAL CONDITIONS IN THE PROVINCES.

Instructions have been given to all employees of the Bureau of Agriculture stationed in the provinces to prepare at the end of each month a report on the agricultural conditions for that month in the province in which they are stationed. Arrangements have also been made to obtain similar reports from other sources. All of these data will be compiled and published in the REVIEW as a department of "Provincial Reports," the object being to furnish the readers of the REVIEW each month with a brief summary of agricultural conditions throughout the entire Archipelago.

If there is a large increase in sugar-cane planting in Pampanga and Batangas, this information is of value to the sugar planters of Occidental Negros and Iloilo. If good tobacco is being grown in Panay, Leyte, and Masbate, such information is of interest to the tobacco grower of the Cagayan Valley. If the

abacá planter in Davao is obtaining large yields by the use of improved varieties and irrigation, the abacá planters of Albay and the other leading abacá-producing provinces should be informed of these facts. These are examples of some of the ways in which a summary of agricultural conditions may be of benefit to the farmers of the Islands.

In order to make this department of the REVIEW as complete and serviceable as possible, it is desired that our readers will contribute to it material in the form of reports or notes on the agricultural conditions in the locality in which they live.

AGRICULTURAL EXTENSION WORK IN THE PHILIPPINE ISLANDS.

By H. T. EDWARDS,

Assistant to the Director of Agriculture.

The improvement of agricultural conditions in any country is based on two general lines of work, viz, that of investigation and that of education. At the experiment stations, in the laboratories, and from other sources investigators and specialists are continually obtaining new information regarding agricultural work. The essential reason for obtaining this information is that it may be transmitted to the farmers and utilized by them in improving conditions on their farms. The various means of transmitting this information, or of educating the farmer, may be grouped under the one head of "Agricultural Extension Work." It will be seen, therefore, that agricultural extension work is the connecting link between the investigator and the farmer. It is largely by means of extension work that scientific investigations pertaining to agriculture are made of economic value.

In a country like the Philippine Islands, where agriculture is the principal industry of the people and where the farmers have very limited means for obtaining information, the importance of extension work can hardly be overestimated. In the United States, and in other countries where agriculture is highly developed, the farmers have many facilities for keeping in touch with agricultural progress which the farmers in these Islands do not have. It is desirable, therefore, that the means of disseminating information among the farmers in the Philippine Islands be developed in every way possible. This work has always formed an important part of the work of the Bureau of Agriculture, and increasing attention is being given to it at the present time.

Agricultural extension work may be carried on along a number of different lines, among the more important of which are the following: Lecture work, distribution of printed matter, visiting

of farms by field inspectors, coöperative demonstration work, agricultural fairs and shows, and the formation of agricultural societies and associations. Each one of these methods has certain advantages, and all can be used more or less successfully as a means of giving information to the farmers.

Lecture work is a branch of agricultural extension work that has been carried on very extensively and successfully in the United States and other countries, largely as "farmers' institutes." The farmers' institute is a conference or meeting of the farmers of some section or locality. At these institutes usually one or more lecturers are present who are especially qualified to discuss some subject or subjects of interest to the farmers present. After each lecture there is a general discussion of the subject that has been presented, questions are asked, and opinions are given. In this way the interest of the audience is stimulated, and each farmer present has an opportunity to ask for any information that he may desire.

The agricultural conferences held in Manila during the last Carnival, and which will be continued during the next Carnival, were essentially farmers' institutes. These conferences were held for a period of four days, were attended by 73 delegates representing 22 provinces, and were one of the most successful features of the Carnival. On the first day of the agricultural conferences addresses were delivered by His Excellency, the Governor-General, and other prominent Government officials, in which a number of vital questions pertaining to the agricultural development of the entire country were discussed. Each of the following sessions was opened with a lecture on some one of the staple Philippine crops, after which the delegates present questioned the speaker and stated their own experience in growing these crops. There was a free interchange of ideas and many valuable suggestions were offered. The success of these agricultural conferences fully demonstrated the desirability of holding similar conferences in Manila each year. It also suggested that it might be well to hold agricultural conferences in the different provincial capitals during the year.

Another form of lecture work that is now being carried on by the Bureau of Agriculture in these Islands, and one that promises to give good results, is for a specialist on some line of agricultural work to travel through a section of the country where that line of work is of importance, and give short lectures or talks in the different municipalities. Where it is practicable to do so, these talks are illustrated by the use of a stereopticon. At the close of each lecture the people present are invited to

question the speaker on the subject that has been presented. One obstacle to lecture work in these Islands is that so many different languages and dialects are spoken. A large part of the people whom it is most desired to reach do not speak or understand either English or Spanish, and it is difficult to secure persons qualified to intelligently discuss modern agricultural work, who can speak any of the local dialects. In spite of this obstacle, however, much good can be accomplished by this work. There is always a part of the audience that understands either English or Spanish and, by means of these persons, the information given is spread among the people. Perhaps the most important feature of lecture work is, not the direct information given by the lecturer, but the fact that discussion is started and interest is aroused, which is the first step toward the improvement of existing conditions.

On a recent trip through the Provinces of La Union, Ilocos Sur, and Ilocos Norte the fiber expert of the Bureau of Agriculture delivered a series of 12 extension-work lectures, 9 of which were illustrated. The enthusiasm with which these lectures were received by the people far exceeded what had been expected. Audiences averaging 150 persons attended each lecture, and it was estimated that 1,000 farmers were present at the 12 lectures that were given. At the close of each lecture the people present were invited to question the speaker and to discuss the subject that had been presented. Questions covering all phases of the subjects of the lectures were asked, and the greatest interest was shown. Requests for lectures were received from a number of municipalities that it was impracticable to visit, and there was every indication that this form of extension work is one that can profitably be used in other provinces.

The distribution of printed matter is one of the most common and widely used means of agricultural extension work. The agricultural paper and the farmers' bulletin are now well known throughout the civilized world. The use of printed matter as a means of educating the farmers of the Philippine Islands has been freely, and in a measure justly, criticized. It should be remembered, however, that the farmer in these Islands ranges from the well-educated and progressive man, who can use to advantage highly technical publications, to the uneducated and ignorant man, who can not read his own dialect. The same means of education can not be used for all, neither will any one publication be of equal value to all farmers who read. As a result of these conditions we have in the Philippine Islands a variety of publications, with the purely scientific magazine and

the elementary one-page leaflet printed in the local dialects representing the opposite extremes. Each of these different publications is issued for some specific purpose, and is intended for some particular class of readers.

A number of different publications have been issued by the Bureau of Agriculture and distributed among the Philippine farmers. Soon after the organization of the Bureau, a series of "farmers' bulletins" was started, of which fifteen have been published. The majority of these bulletins treat of staple Philippine crops, and are intended for the more progressive farmers who are interested in introducing improved methods of growing these crops. A series of bulletins of a more technical nature, known as "bulletins of the Bureau of Agriculture," has also been issued, seven of these bulletins having been published. In 1906 a series of monthly "press bulletins" was started, which were later replaced by the PHILIPPINE AGRICULTURAL REVIEW. As there seemed to be a demand for a regular monthly agricultural publication that should bring the farmers throughout the Islands more closely in touch with the work of the Bureau of Agriculture, the PHILIPPINE AGRICULTURAL REVIEW was started in January, 1908. Since that time the REVIEW has been the principal publication of the Bureau and has, in a measure, taken the place of the bulletins formerly issued. In addition to the above-mentioned publications a number of elementary circulars and posters, printed in English, Spanish, and the more important local dialects, have been widely distributed. While the use of printed matter is a valuable and important part of extension work, it is one of the most difficult to carry on satisfactorily in this country. It is probable that the more general distribution of elementary matter, printed in the local dialects and used in connection with lecture work, would give good results.

It is the opinion of the writer that the most satisfactory way of disseminating information among the farmers of the Philippine Islands, and of improving conditions on the small farms which constitute the great bulk of Philippine agriculture, is by means of trained field inspectors. The work of these field inspectors should be to go to the farmers on their farms and not only tell them what to do, but also show them how to do it. A capable field inspector can show the farmer how his land should be prepared; how his crops should be planted, cultivated, and harvested; how to fight insects and other pests; and how to use such fertilizers as may be available. In these and many other ways the inspector can get results that can not be obtained in any other way. This

work can not be satisfactorily done by one or two visits, but by regular inspections made throughout the year over a limited territory. An untrained man in this work can do more harm in a month than a capable man can do good in a year, as nothing is more difficult than to regain the confidence of a Filipino farmer when it has once been lost. The use of field inspectors, therefore, can only be brought about gradually as suitable men can be obtained and trained for the work.

Closely related to, and in fact a part of, the field inspector's work is coöperative demonstration work. This is not, strictly speaking, extension work, but it may be so considered in these Islands. In describing the coöperative demonstration work of the United States Department of Agriculture, the Secretary of Agriculture, in his Annual Report for the year 1908, states as follows:

> The object of the farmers' coöperative demonstration work now being carried on in the South is to place a practical object lesson before the farmer, illustrating the best and most profitable method of producing the standard farm crops and to secure active participation in such demonstrations by the farmers themselves. It is an effort to teach the farmer to help himself through the influence of good local assistance, aided and guided by such means as the Department may find it necessary to supply. * * * From one farm in Texas and one agent in 1903 the work expanded in 1908 to 32,000 farms with 157 field agents covering portions of 11 States, from Texas to Virginia, inclusive. * * * It is stated to the farmers that they can increase their crop yields two, three, or four fold at a reduced cost per acre, and that this may be almost a net gain by producing on the farms the food supply for family and teams. They are asked to prove it by working an acre or more according to directions. The necessary work on this part of the farm must be done by the farmer and not by a Government agent, because the whole object lesson is thereby brought closer to the people. The demonstrating farmer understands it better because he does the work. His neighbors believe that what he has done they can do. The agent makes monthly inspections of fields and gives additional instructions.

There is no doubt that coöperative demonstration work can be made effective in these Islands. A number of Filipino farmers have already shown interest in this work, and have stated that they would willingly take up such work under the direction of the Bureau of Agriculture.

At the close of the agricultural conferences held in Manila during the last Carnival there was organized an Insular Agricultural Association, and it was recommended that provincial agricultural associations be organized in the different provinces. A number of such associations have since been formed. The local agricultural association, having as its object the improvement of agriculture in the district where it is formed, is a

valuable means of increasing interest in improved methods, and of bringing the people in touch with work that is being done throughout their own province and in other parts of the Islands.

The holding of agricultural fairs and shows is a popular, and in many ways valuable, means of educational work for the farmers. When such fairs are held on a large scale it is usually practicable to provide not only for exhibits of agricultural products and live stock, but also for lecture work, machinery demonstrations, and the distribution of printed matter. The agricultural and industrial features of the annual Carnival held in Manila are being given more prominence each year, and probably no other time could be selected for holding an agricultural show in Manila that would be as satisfactory as during the Carnival. There is a growing tendency to hold provincial fairs, both as a means of preparing for the Carnival exhibit and for the purpose of reaching the people who are not able to attend the Carnival in Manila. It is probable that these provincial fairs, if well organized and held throughout the Islands, would be of direct benefit to a much larger number of farmers than the annual fair held in Manila.

The first step in introducing agricultural extension work is to gain a thorough knowledge of conditions as they now exist on the farms; the second is to win the confidence of the farmers. All work should be based on actual and not theoretical conditions, and no attempt should be made to introduce methods that are impracticable. The average Filipino farmer is not inclined to be progressive, or to adopt new methods until he is fully convinced of their value. Even when so inclined he is usually unable to introduce any improvements that necessitate any considerable increase in expenditure. The actual needs of the people, their wishes and desires, and the means which they have to work with should always receive consideration. Agricultural extension work that is based on these facts, and that is carried on systematically and actively, will produce positive and satisfactory results.

[Agricultural Extension Work Lecture No. 1.][1]

THE CULTIVATION OF CORN IN THE PHILIPPINE ISLANDS.

Compiled by H. T. Edwards,

Assistant to the Director of Agriculture.

Why is corn a good crop to grow?

Corn is a crop that is grown in every province in the Philippine Islands. It is a crop that could be grown in nearly every municipality and barrio.

There are many different reasons why corn is a good crop for you to grow. Do you know what some of these reasons are? First, corn is one of the best food crops. I mean by a food crop one that will furnish a supply of food for yourself and your family. Some people think that corn is only a food for hogs and carabaos. This is not true. Corn is just as good a food as rice, and it can be grown in many places where rice will not grow well. It can also be grown at seasons of the year when there is not enough rain for rice. Corn is not only a good food for yourself and your family, but also it is a good food for your horses, carabaos, pigs, and chickens. Second, corn is a good money crop. I mean by a money crop, one that you can sell. When you grow more corn than you need for food, you can sell that part which you do not need yourself. Crops like abacá and tobacco are good money crops, but they are not food crops. You can not eat abacá and you can not eat tobacco, but you must sell these crops in order to get money to buy food. When you grow only money crops, and the prices of these crops are low, you get very little money. When you grow a crop like corn, that is both a food crop and a money crop, if the price is low you can use all, or at least a part, of the crop for food. Third,

[1] The Agricultural Extension Work Lectures are elementary papers intended, primarily, for lecture work in the provinces.

another reason why corn is a good crop for you to grow is that it is not as difficult to grow good corn as it is some other crops. Abacá will not grow in places where there is but little rain. In order to grow good tobacco you must have a certain kind of soil and just the right kind of climate. Rice requires a great deal of water. Corn, however, can be grown in places where abacá will grow and in places where abacá will not grow, and it can be grown on tobacco soil and on soil that will not produce good tobacco. Fourth, I will give one more reason why corn is a good crop, and that is, you can grow two and even three crops of corn on the same land each year. When you plant coconuts you must wait seven or eight years before you can harvest the first crop. When you plant corn you have a crop in a few weeks and, if the weather conditions will permit, you can soon plant another crop. These are only a few of the reasons why corn is a good crop for you to grow, and you can probably think of others.

How can we grow good corn?

If we know that corn is a good crop to grow, the next thing to know is how to grow a good crop. Many farmers in this province grow corn, but only a few of them grow large crops of good corn. What is the reason why we see so much poor corn in this province, and in other provinces? Every farmer would rather grow a good crop than a poor crop, and it takes only a little more work to grow good corn than it takes to grow poor corn. What are some of the things that we must do if we are to grow good corn? I am going to speak of five things that are necessary if we are to grow good corn, and these are:

First, we must select good seed for planting.

Second, we must prepare the land well before the seed is planted.

Third, we must plant the seed at the right season of the year.

Fourth, we must plant the seed in the right way.

Fifth, we must cultivate the growing crop.

Why should good seed be used?

Many farmers think that they can grow a good crop from poor seed, but this can not be done. You can not grow a good plant from a poor seed, and when you plant poor seed corn you will have a crop of poor corn. When you plant good seed in good soil, and then take care of the growing crop, you will get a good crop. The first thing to do, then, is to plant good seed.

What is good seed?

Some one may wish to know what is good seed corn. The best answer to this question is that good seed corn is seed corn that

PLATE II.—MEXICAN JUNE CORN AT THE SINGALONG EXPERIMENT STATION, MANILA.

will produce a large crop of good corn. I have here an ear of good seed corn, and I want you all to look at it carefully. You will see first that this is a large ear. The largest ears are not always the best for seed, but, as a general rule, you should pick out large ears when you are selecting your seed for planting. You will see, also, that this ear is about the same size at both ends. Do not use ears that are very large at the butt and very small at the tip. On this ear the rows of kernels are nearly straight, and the kernels extend well over the ends of the ear, so that both the butt and the tip are full and round. Each kernel, you will see, is smooth and flat, so that the kernels fit together on the cob. Do not use the kernels at the tip and butt of the ear for seed, as these kernels are usually small.

How can we get good seed?

The best way to get good seed corn is to go through your field at the time of harvest and pick out the best plants. Then take the largest and best ears from these plants and save these ears for seed. In this way you can select good plants and also good ears. Do not take your ears of seed corn from tall, slender plants; or from very small, short plants. A good corn plant should have a strong, thick stalk of medium height, with from one to three well-developed ears.

Every farmer who plants corn should save the best ears from each crop for planting the following crop. If no seed has been saved, he should get the best ears of corn that can be had in the municipality where he lives and use these for seed. If good seed corn can not be had in the locality where he lives, the farmer should write to the Bureau of Agriculture in Manila, which will send him free of charge a small quantity of good seed corn.

Why should the land be well prepared before the corn is planted?

After you have obtained a supply of good seed for planting, the first work to be done is to prepare the land. Some farmers dig a small hole in the ground with a stick, plant the corn in this hole, and then do not understand why the plant does not grow well. A carabao can not live and grow without food. Plants require food just the same as animals do, and plants can not live and grow without food. The food for plants is in the soil. An animal takes its food in through its mouth, and a plant takes its food in through its roots. When the soil is so hard that the roots can not grow well, but little food is obtained and the plant remains small. Sometimes there is not enough food in the soil for the plants, and then it is necessary to put

manure or some other fertilizer on the land. The first thing to do, however, is to prepare the land well so that the roots of the plants can grow and reach the food that is in the soil.

How should the land be prepared?

In preparing land for corn, the soil should first be plowed, or dug up with a spade or some other implement. It should then be made smooth with a harrow or rake, and all large lumps broken up. Do not plow or dig up the soil when the land is very wet or when it is very dry. If very wet, it will become baked by the sun and will soon be as hard as before it was plowed. If very dry, the land is usually difficult to plow, and it will often break up in large lumps. Plowing or spading should be done after a light rain when the soil is moist but not wet. When there are corn stalks, or other trash on the land such material should be plowed under and mixed with the soil. This material will rot and will improve the condition of the soil. When there is so much trash that it can not be plowed under, it should be burned on the field where the corn is to be planted. The ashes will make a valuable plant food.

When should corn be planted?

The best time of the year for planting corn in the Philippine Islands is near the end of the rainy season. At this season the soil is moist, and the light rains will give the young plants a good start. Do not plant corn in soil that is very wet, or in soil that is very dry. Where the soil is very wet the seed will rot, and where it is very dry the seed will not grow. If the young plants get a good start, and are then cultivated, they will continue to grow well during the hot, dry weather. Where two or three crops of corn are grown on the same land each year, it will be necessary to plant at different seasons. Good results can usually be obtained, however, if the land is well prepared, if the seed is planted when the soil is in the right condition, and if the crop is kept cultivated.

How should corn be planted?

Corn must be planted differently on different kinds of soil. More plants can be grown on good, rich soil than can be grown on poor soil. On average land corn should be planted in hills 1 meter apart each way, with two plants in each hill. Most of the farmers in the Philippine Islands plant too much seed. The results are that the plants are small, the corn is of poor quality, and the yield is small. If you will plant a smaller amount of seed you will get a larger crop, and better corn.

Why should corn be cultivated?

Many farmers plant their corn, and then do no more work until the crop is ready to harvest. You can not grow a good

crop of corn unless you take care of it. When the growing corn is not cultivated the weeds grow, and the soil becomes baked and hard. The weeds use up the food that is needed by the corn, and the roots of the corn can not grow well in the hard soil.

How should corn be cultivated?

Cultivation should begin almost as soon as the seed is planted, and should continue until the plants begin to silk. It is well to stir the surface of the soil after every rain, so that it will not become baked and hard. Corn should be cultivated not less often than every two weeks from the time it is planted until it is mature. When the plants are small the cultivation should be deep so that the soil may be kept loose. When the soil is loose the roots of the plant can spread easily and the plant can get more food than when the soil is hard. Later cultivations should be shallow and not so near the plants, so as not to cut off the roots. When the weather is very dry corn should be given frequent shallow cultivations.

In what ways can corn be used?

Corn can be used in many different ways. When it is milk-ripe, that is, just before the grains begin to harden, the ears can be boiled or roasted. This is one of the best ways to use corn, but very little corn is used in this way in the Philippine Islands. The grain, when mature, can be crushed and boiled like rice; or, it can be ground into meal and used in many different ways. The custom of crushing the grain and feeding all of the soft part to the hogs and the chickens is a very bad one, as this soft part is the best part of the corn for food.

Does it pay to grow GOOD *corn?*

In this lecture we have stated some of the reasons why corn is a good crop for you to grow. We have stated, also, some of the things that you should do in order to grow good corn. These things are; to select good seed for planting, to prepare the land before the seed is planted, to plant at the right time and in the right way, and to take care of the growing crop. No farmer should be satisfied to grow a poor crop when he can grow a good crop. To grow a crop of good corn will require a little more work than to grow a crop of poor corn, but it is work that will pay you well.

Where can we get good seed and information about corn?

The Bureau of Agriculture in Manila will send you a small quantity of good seed corn for planting, from which you can raise a supply of good seed, and will also give you information about planting, cultivating, or cooking corn. If you want such seed, or any information about corn, write a letter to the Director of Agriculture, Manila, P. I.

THE VALUE OF A GARDEN COURSE IN PHILIPPINE SCHOOLS.

By S. C. KELLEHER,

Teacher of Agriculture in the Philippine Normal School.

The school garden is a phase of educational work that has attracted considerable attention in the Philippine Islands, particularly during the past year. School gardening has been a feature of primary and intermediate work in the schools of these Islands for some years, but the results obtained have not been at all uniform. In some provinces but little attention has been given to this work, while in others it has been made a prominent feature of the educational system.

Various conditions have contributed to the increasing amount of attention that is now being given to school gardening and it seems probable that this line of work will continue to grow in importance. A bulletin on gardening has been prepared and will be distributed to teachers throughout the Archipelago. The course of study for the present school year requires gardening and makes it a part of the regular school work.

The benefits to be derived from teaching gardening in the schools are many, among the more important of which may be mentioned the following: In the school gardens the pupils gain an elementary practical knowledge of soils, plants, and agricultural work; they learn the value of a good garden and the uses of its products; they learn to work with their hands and thereby gain some appreciation of the dignity of labor; they acquire habits of industry; and they learn to respect the property rights of others.

The school garden can and should be made a small demonstration farm where the pupil can put into actual practice the knowledge which he acquires in the class room. The study of soils, when confined to a text-book, will be of little interest or value to the average student, but when such study is supplemented by field work and the student begins to find out what can and what can not be done with different soils and with

the same soil under different conditions, the subject assumes an entirely different aspect. In the class room the pupil learns certain things about the planting of seeds, the culture of plants, and the harvesting of crops, but unless this knowledge can be fixed in his mind by using the information thus gained it will soon be forgotten. For those pupils especially who will return to the farms and be dependent on agriculture for their future livelihood, this training in the school garden should be of great value.

One of the important and very practical features of the school garden is the fact that it leads to the establishment of home gardens. The pupil who learns how to grow and how to use garden vegetables is led to realize the desirability of increasing the food supply at his home by the means of a home garden. There are very few home gardens in the Philippines at the present time, and as a result the diet of a majority of the Filipino people is largely confined to rice and fish. The more general use of such vegetables as could be grown without difficulty in home gardens would not only increase the healthfulness and attractiveness of the daily diet of the people, but would also tend to reduce the cost of their daily food supply.

By means of the school garden the pupils are being taught to work with their hands, and are thereby learning to understand something of the dignity of labor. The idea that physical labor is degrading is too widely prevalent for the good of the people, and it is essential that something be done to correct this idea. By offering prizes for the best individual plots in each garden the pupil soon becomes interested in obtaining results superior to those obtained by his associates. He learns that such results can not be obtained without persistent and hard physical labor, and he undertakes such labor with enthusiasm.

Each pupil is responsible for his own plot in the garden and the products of that plot are his own personal property. As these products are the direct result of his own labor he fully appreciates their value, as he does also the value of similar products belonging to his associates. He soon learns, not only to care for his own property, but also to respect the property that belongs to others.

The character of the gardening to be undertaken in any locality must depend largely upon the situation of the school. We have divided school gardening into three branches, making it possible to carry on at least one of these branches in every school in the Philippines. These three branches are:

(1) *Vegetable gardens.*—These are to be established where

suitable land is available. The work will consist of raising such kinds of vegetables as thrive in that locality.

(2) *Plant nurseries.*—These are to be established at high schools and other places where there is enough suitable land available. These nurseries will serve as distributing points for the best varieties of different kinds of economic plants.

(3) *Flower and ornamental plant culture.*—It is proposed to carry on this work where the school grounds are not large enough for a vegetable garden, or where there are no school grounds, by using boxes and bamboo tubes. The essential principles of plant culture can be taught and a fondness for plants developed with the plants that are grown in this manner.

The principles which are to be sought in the instruction are the same in whichever branch of gardening is followed. They include a study of soils; use and care of tools; selection and preservation of seed; seed testing and germination; methods of transplanting; insect enemies and their prevention; experiments to show the need to the plant of light, air, and moisture; and the proper ways of tillings, watering, and manuring.

At the Normal School garden tests are being made of different vegetables to find their suitability to this locality, and as near as possible their adaptability to the entire Archipelago. As far as plants are able they vary and adjust themselves to the environment in which they are placed. Some plants find no difficulty in adjusting themselves; others lack the power to adapt themselves to a wide range of conditions and when placed in an unfavorable environment quickly succumb. We are experimenting with different plants for the purpose of studying those that can be assisted in their growth by shading and other arrangements for influencing some of the unfavorable climatic conditions.

It is possible to breed up plants and by the continued selection of individuals that give the best results to develop a strain of high productiveness and a strain of resistance that will be able to withstand unfavorable conditions. An effort is being made to learn the varieties of plants that will best resist disease and insect pests. By making observations, such as when insect pests or plant diseases destroy a large number of individuals leaving only the more resistant plants, we can save these resisting strains and develop that resisting quality. The great value of a straggling plant here and there that escapes insects when others around it are destroyed, or escapes some fungus disease when surrounding plants succumb, should be appreciated and its seeds saved. Many valuable adaptations have been secured in this way.

PLATE III.—CHINESE DWARF BANANA, LAMAO EXPERIMENT STATION.

THE LAMAO EXPERIMENT STATION.

By ORANGE B. BURREL, *Superintendent.*

The Lamao Experiment Station is located about 20 miles west of Manila in Bataan Province on the Lamao Forest Reserve. Lamao has no steamboat service, and to reach the station it is necessary to take a *banca* from Limay, 4 miles to the north, where boats from Manila call three times a week.

During the latter part of 1903 the Bureau of Forestry started work at Lamao with the intention of establishing a forest nursery. About 2 acres of level ground near the beach were cleared and planted to lawn grass and beds of shrubbery, with a border on three sides of about thirty varieties of ornamental trees. Some land was cleared and seeds of timber trees planted. Two years later, in 1905, a part of the reserve including the cultivated area was transferred to the Bureau of Agriculture.

At present about 40 hectares are under cultivation, inclosed by a 48-inch woven wire fence, which keeps out the wild hogs that formerly did great damage to crops of all kinds. It is nearly all bottom land, lying along the northern bank of the Lamao River, and varies from red clay to beach sand, with many variations of sandy loam; some of it so porous that it is difficult to carry water in an open ditch for irrigation purposes. At intervals, from November to July, irrigation is necessary. Plenty of water may be obtained from a ditch which leaves the river about a mile above the station.

A large nipa house, a small barn, and a shed for storing tools are the only buildings. The equipment consists of a few small plows, harrows, and hand tools, with four Chinese bullocks for work animals, and one American saddle horse.

About fifteen laborers are usually employed at this station. No difficulty has been experienced in getting all the men needed at ₱0.75 per day. The labor is of fairly good quality, as the men live with their families in a small barrio on the farm. Many of them have worked on the place for several years. The total expense of running the station is about ₱4,400 a year.

The work in the past has been confined chiefly to the testing of vegetables and the growing of nursery stock for distribution such as kapok, abacá, maguey, pineapples, and bananas. Many foreign and native fruit trees have also been planted which have not yet come to the bearing age. Half a hectare of mulberries, planted two years ago, furnished over 10,000 cuttings this year, which were distributed through the provinces.

A number of hectares of native maguey and Hawaiian sisal hemp, planted on a rocky hillside three years ago, this year furnished an average of 30 mature leaves 1½ meters in length to the plant.

Seventy-seven plants of each of the following varieties of bananas were planted in July, 1908, and during the fiscal year just closed the following data were kept on the yield and cost of production:

Variety.	Number bunches harvested.	Average weight.	Cost per bunch.	Yield per hectare.
		Kilos.		*Kilos.*
Chinese Dwarf	29	6.37	₱0.386	131.81
Lacatan	21	2.86	.47	95.40
Gloria	69	4.12	.117	313.09
Latundan	154	1.02	.025	700.00
Saba	117	5.98	.032	531.81
Matabia	124	7.43	.057	563.18

The figures given are only for the cost of labor during the year. Clean cultivation and irrigation were given. The yield was lessened by a leaf rot which weakened the plants and caused many of the bunches to break off before maturity. The Chinese Dwarf and Lacatan were injured more than the other varieties. This disease can be largely eradicated by trimming off all affected parts of the young plants and removing all rotting leaves and old stalks from the base of the plants. The Lacatan variety of bananas is one of the best in quality grown in the Philippines, and the Chinese Dwarf is a close second, with large bunches of good-sized fruits, yellowish when ripe, and rather tender and sweet. It has the advantage also of having stocky plants only 1½ to 2 meters in height, which are not broken off by *baguios* as the tall-growing varieties often are. The Saba and Matabia varieties are plantains and used only after being cooked. They are eaten boiled, fried, and prepared in other ways. The Matabia makes a very good substitute for apples in pies and puddings.

A few Lisbon lemon trees, six years of age, yielded this year an average of 24 lemons of fair size and very good quality. A field of Liberian coffee, planted in 1906, has made a healthy

PLATE IV.—FIELD OF PHILIPPINE MAGUEY, LAMAO EXPERIMENT STATION.

growth and in February and March this year ripened a half kilo of berries on some of the best trees. A plot of native pineapples with a slat shade yielded fruits averaging one-half kilo more than those on an adjoining unshaded plot.

A few of the more permanent crops now growing are coffee of the following varieties: Liberian, Robusta, Arabian, Hawaiian, Lavarian, and a native variety from Calinog; Cuban Queen, Red Spanish, Malaluge, Sugar Loaf, Hawaiian and Natal Canning pineapples; Avocado pears four years old; bananas under six methods of culture; Panama hat palms, Raphia and date palms; oranges of the Washington Navel, Bahia Navel, Navelencia and Mediterranean varieties; grapefruit; Lisbon Belais and Villa France lemons; native kapok and two varieties from Dahomey, East Africa; achiote, the annato of commerce; Borneo and Hawaiian papayas; lemon grass, and about 30 varieties of native and foreign tropical fruit trees.

About 360 samples of upland rice, 20 varieties of native corn, and 10 varieties of vegetables are at present under observation.

During the next few years special efforts will be made to test the many varieties of native vegetables and fruits and to improve by selection and breeding those varieties which prove of value. With few exceptions the native are much more satisfactory than American varieties for growth in the Philippines. American peas, beans, squashes, beets, onions, turnips, cabbages, celery, and lemons are generally unsatisfactory, but, by growing a variety of native vegetables and a few foreign kinds, fresh vegetables can be harvested the year round by everyone possessing a small garden plot.

American corn of the Mexican June variety has proven especially productive and of very good quality for table use as green corn, but it is not generally liked by the Filipinos for a field crop because it is soft and much more susceptible to molds and the attacks of weevils than is the hard, flinty grain of native varieties. By crossing with the native varieties and by selection, it is hoped to secure a variety with the production and good qualities of the Mexican June and the hardness and keeping qualities of the native corn.

American tomatoes are fairly productive in some locations, but their period of bearing is short and, in many instances, they die before ripening fruit. The native varieties also have a short bearing period and are small and uneven, but by using them with American varieties and by cross-breeding it is hoped that a variety can be produced in a few years far superior to any now growing in the Islands.

A few things which may be harvested the year round are: Green corn, the Mexican June variety; okra, eggplant, sitao, batao, condol, green onions, camotes, some varieties of squashes, papayas, and bananas. Following is a list with a short description and cultural notes of some native vegetables of special value for general use:

Mungo (Balatong) *Phaseolus mungo.*—An upright bushy plant, 60 centimeters to 1 meter in height, with small leaves and yellow flowers. Numerous small pods the diameter of a lead pencil and 4 to 6 centimeters long borne in clusters above the foliage. The green pods are prepared the same as string beans. The ripe beans are used extensively in soups or may be eaten cooked with pork the same as common white beans. They are of very good quality. Should be planted in drills 1 meter apart and thinned to 15 centimeters in the row. They may be planted from October 15 to March 1; they will not bear during the rainy season, because heavy rains break off the blossoms and pods. They begin bearing five to seven weeks after planting and continue for from six to eight weeks.

Sitao (*Vigna catjang* Endl.).—This plant has long slender vines with bunches of pink blossoms. The pods are long and narrow, 15 to 20 centimeters in length and 1 centimeter wide. They are of very good quality and are eaten green the same as string beans; they may be planted at any time of the year beside trellises 1½ meters apart; they begin to bear in three months and continue bearing six to eight weeks.

Cadios (*Cajanus indicus*).—A much-branched, leguminous plant 5 to 6 feet tall, bearing yellow flowers and small pods resembling those of mungo. The green pods and ripe beans are eaten the same as mungo. They should be planted 1 meter apart in June and will bear in December or January.

Bilao (*Lablab cultratus*).—The manner of growth is like that of sitao, with flat pods about 2 centimeters wide and 6 centimeters long borne in clusters above the foliage. They are of very good quality used as string beans; the dry beans are also used. Bilao may be planted at any time near permanent trellises or arbors; it begins bearing in three or four months and bears almost continuously for several years if irrigation is given during the dry season. Where no irrigation is used plants cut off at the ground during the dry season will grow up again when the rains come.

Pechay (*Sinapis brassicata*).—A plant with broad smooth leaves the size and shape of turnip leaves. The leaves when cooked are eaten for greens or fresh in salads. It is ready for use a few weeks after planting. It should be planted from October to April in drills 50 centimeters apart.

Condol (*Benincasa cerifera*).—A plant resembling the cucumber vine in growth and blossom. The fruit is shaped like a watermelon, 28 to 40 centimeters long and 12 to 15 centimeters in diameter. The surface is thickly covered with short, stiff hairs and a fine white powder which easily rubs off. Half-grown fruits are eaten boiled with meat. Mature fruits are used for preserves and pickles. They very closely resemble watermelon pickles when prepared in the same way. The water in which they are boiled should be thoroughly drained off before they are used. Plant in hills 2 meters apart in October to December. The plant will begin bearing in three to four months and continue for several months. Mature fruits stored in a dry place will keep in good condition for five or six months.

Eggplant (Talong) (*Solanum melongena*).—This vegetable is too well known to need description. The long green native variety is of better quality than either the white or purple American varieties. Seeds should be sown in a seedbox or seed bed from November to March and transplanted to the field when 10 centimeters high, 50 centimeters apart in rows a little more than 1 meter apart. The seedlings will die if kept too damp. They will begin bearing in three to four months and continue for six months or a year.

Cucumber (Calavaga) (*Cucumis sativus*).—Several varieties are grown which are of very good quality for slicing and salads. It may be planted from October to February in hills 1½ meters apart; it begins bearing in four to six weeks and continues for six to eight weeks.

Radish (Rabanos) (*Raphanus sativus*).—The long, white Chinese variety thrives here when planted during the cool season. It is large enough for table use in five to six weeks after planting; when larger they may be boiled and served like turnips. The Red Globe American variety thrives here also during the cool season, but difficulty is experienced in getting seeds which will germinate.

Squash (Calabasang Pula) (*Curcurbita maxima*).—There are several varieties of native round squashes of very good quality. One variety with small, round, green fruits of good quality may be grown during the rainy season. The other variety should be planted from November to January: It will begin bearing in about three months and continue for three months.

Upo (Calabasa) (*Lagenaria vulgaris*).—This variety grows a long, climbing vine and should be planted near a trellis or arbor at any time of the year. One variety bears gourd-shaped fruits 40 to 80 centimeters long and 16 to 25 centimeters in diameter. Another has very large round fruits. The quality of both is very poor.

Tomato (Camatis) (*Lycopersicum esculentum*).—This plant needs no description. Seeds should be planted in seedboxes or beds in October and November, and when large enough transplanted to the field about 1 meter apart; it begins bearing in ten to twelve weeks.

Patola (*Luffa aegyptiaca*).—A long climbling vine with coarse leaves and yellow flowers. It bears gourd-shaped fruits 25 to 50 centimeters long and 8 to 12 centimeters in diameter. The rough skin is divided into sections by depressions running from end to end. It is eaten boiled with meat or seasoned with butter, salt, and pepper; it is of rather coarse texture and poor quality; it should be planted beside a trellis.

Ampalaya (*Momordica balsamina*).—A slender, trailing vine with 5-lobed pale-green leaves and small yellow blossoms. The fruit is cylindrical, 5 to 8 centimeters in length with the surface covered by numerous wrinkled ridges. It has a very bitter flavor resembling quinine, but it is relished by the natives boiled alone or with meat. It may be planted at any time.

Melons.—Native varieties thrive well when planted at the end of the rainy season, but do not have much sweetness. American varieties sometimes succeed also, but are so thin skinned that they are often pecked by birds before ripening.

Camotes, or native sweet potatoes, of many varieties thrive here and some of them are of very good quality. They thrive better when planted at the beginning of the rainy season and are ready to harvest in six to eight months. They are usually propagated by cutting green vines into pieces about 15 to 20 centimeters long and planting them with about half their length in the ground.

Tugui (*Dioscorea sativa*) grows long, slender climbing vines. The tubers are borne in clusters around the main stem, and are cylindrical in shape, 6 to 12 centimeters long and 2½ to 4 centimeters in diameter. The flesh is white, fine grained and smooth to the taste. It may be planted at any time, but will thrive best during the rainy season. Poles at least 2 meters in height should be placed for each plant to climb upon. Plants die when the tubers ripen.

Ube (*Dioscorea elata*).—There are several varieties, all of which produce long, coarse, climbing vines and large leaves. The tubers are large and grow in a solid mass, all connected at the same stem end; they are fine grained and smooth to the taste with distinctive flavor. They may be planted at any time.

Gabe (*Colocasia antiquorum*).—A perennial herb with very large leaves broad at the base and pointed at the tip. The fleshy roots, leaves, and young shoots are used for food. Several varieties are grown in the Philippines. The flesh of the tubers is fine and smooth to the taste, with a distinctive flavor which varies in different varieties. They thrive best on low, loose, moist soil and are propagated by planting the tubers.

Camotes, tugui, ube, and gabe grow best during the rainy season, and when planted in May or June will ripen in December or January.

STATION AND FARM REPORTS FOR THE MONTH OF AUGUST, 1910.

ALABANG STOCK FARM.

Owing to the late rainy season the crops at this farm have had more time to mature and are in better condition than is usual at this time of the year. During the month 35,272 kilos of Guinea grass, 71,818 kilos of sorghum, and 2,832 kilos of other forage (sugar cane, corn, and Para grass) have been cut and fed to the stock on the farm and to the serum herd. At ₱1.25 per hundred kilos, the value of the forage produced during the month was ₱1,375.75.

The Hawaiian sugar cane planted on July 9 is growing rapidly and shows evidences of being extra good cane well adapted to this climate. It is now over 1 meter high. This cane was planted in rows 5 feet apart with 2 feet between each cutting. It was fertilized with a mixture of tankage (1,125 kilos to the hectare) and potassium sulphate (180 kilos to the hectare).

During the month the first steps were taken toward establishing a forest nursery at this farm. An expert from the Bureau of Forestry was sent to the farm, and selected a piece of land on a gentle slope, well drained and protected from severe winds. This piece of land, 100 meters square, has already been plowed and will be prepared for the planting of 20,000 seed which have been delivered by the Bureau of Forestry. These seeds include four varieties—amuguis, acle-parang, dap-dap, and banaba. They will be planted in raised beds, protected from the sun by bamboo shades, and at the proper time transplanted. If this experiment is successful, the nursery will be enlarged from time to time.

Road work is still being carried on and this farm now has 4.5 kilometers of excellent road, equal to the best provincial roads in the Islands. This road work is not only of great advantage to the farm, but these roads also furnish an outlet to the country back of the farm, which is now being opened up by several companies engaged in the growing of sugar cane. (From report of Dr. H. F. Hungerford, acting superintendent, Alabang stock farm.)

PROVINCIAL REPORTS FOR THE MONTH OF AUGUST, 1910.

Cagayan, Luzon.—This Bureau is in receipt of Circular Letter No. 12, from the provincial governor of Cagayan, which was addressed to the municipal presidents and councilmen of all towns in that province. The following extracts are of special interest:

In the frequent inspections which I have made of the towns of this province, I have noted that the number of fruit trees, especially of mango, santol, anonas, langka, orange, and lemon, are very limited in all parts of the province, and if some interest is not taken in planting new trees within five years or less all kinds of fruit trees, which are not only valuable for food but also as money producers, will have completely disappeared.

In view of the interest taken by officials for the good of their respective towns, you are requested to try by every means to encourage your neighbors to plant all kinds of fruit trees which will grow on their land in place of those which have died or are failing to bear on account of age. Each of you should begin to plant new fruit trees on your own land as an example, for in the opinion of the undersigned, example is the best recommendation. I think it would be a good, practicable scheme for the councilmen together with the inhabitants of each barrio, to select a suitable field, and make a nursery from which to transplant trees on the land of everyone desiring to cultivate a fruit orchard. I shall be very glad to know that you have complied with these instructions, and to visit the orchards planted by you.

Mountain Province.—There has been an abundance of rain in this section; during the month of August about 350 millimeters fell. It has been very cool, the maximum temperature for the month never having been above 24.5° C., while the minimum temperature has been as low as 15° C. The planting season begins any time from November to January, harvesting usually begins in the month of March and sometimes continues as late as September. During the past year nearly the whole rice crop was harvested in August. It will be noted that the season for planting and harvesting rice is nearly the opposite from that in the lowlands. There are two varieties of rice grown here, namely, "kapang," which is bearded, and "ortok," which is beardless. The grains of both these varieties have a reddish color. The

flavor of both is quite as good, when cooked, as that of the lowland varieties. From November to March much of the land has to be irrigated. Some insect pests have attacked garden vegetables recently, and cutworms and cabbage worms have done considerable damage to cabbage and tomatoes. Few cases of animal disease have been reported.

In the last year and a half some of the towns which have had seeds furnished them are now growing cabbages, radishes, beans, peas, okra, corn, and American tomatoes. One American near Cervantes, who has his ranch under irrigation, has grown very fine Mexican June corn with large, well-filled ears 10 inches in length, also fine okra, radishes, peas, and beans. (Reports of C. B. Shoemaker, veterinarian, Cervantes, and M. M. Cruz, agricultural assistant, La Trinidad.)

Pangasinan.—The rice crop in Pangasinan has suffered from the lack of rain during the month of August. Many fields will have to be replanted. In quite a few cases farmers have not transplanted their rice on account of insufficient water. (Report of W. A. Kliphardt, veterinarian, Dagupan.)

Tarlac.—Crops in this province have a favorable appearance as plenty of rain has fallen during the past two weeks and the transplanting of rice has been going on steadily. It seems that there will not be much loss of this crop on account of the drought. The province is short of work animals, and it is practically impossible to secure a good carabao for less than ₱130. It seems to me very important that owners of cattle be instructed in the careful handling and care of their stock, also as to the importance of immediately isolating and reporting sick animals. Rinderpest is still prevalent though the cases are isolated. Most of the cattle are being used in the fields, and it is difficult to get them together for inspection. The roads are generally poor; but Victoria has a first-class road extending halfway from Tarlac, and Concepcion and Capiz are having an excellent road constructed. (Report of James Hill, veterinarian, Tarlac.)

Pampanga.—Crops in Pampanga are in fine condition. During August there was very little rice transplanted save on lands where irrigation is possible, but at present the farmers are busy planting and there is plenty of water. Sugar cane is growing nicely and this year will probably show an increase of 50 per cent in the amount of land planted to this crop. In Macabebe and Masantol the rats have destroyed about one-eighth of the seed. Sugar cane is such an important crop that aside from rice very little else is raised. Many of the farmers are buying American plows and machinery to cultivate their lands. (Report of W. H. Curtis, veterinarian, San Fernando.)

Bulacan.—On account of the drought during the past week a very small area has been planted to rice, which is the principal crop in this province. In the southern part of the province rice planting is nearly finished, much of the work having been done in the month of July. In the northern end of the province, especially in the towns of Malolos, Calumpit, Pulilan, Quingua, and Baliuag, very little planting was done in July, and during August there was practically no rain, so that planting was impossible. In some cases the plants in the "semilleros" are nearly dead, so that to secure good strong plants new "semilleros" will have to be made. In the southern end of the province the crop is very poor, so that even with plenty of rainfall from now on a full crop could not be harvested. In the towns of Paombong and Hagonoy the fields are very low, and two crops of rice are raised each year, one of which is heading at present and is in very good condition.

Sugar cane is looking fairly well, and does not seem to be seriously affected by the drought. A few hectares of corn have been planted during the month and it is also in good condition. Considerable corn has been harvested, also, especially in the towns of Baliuag, San Rafael, and Angat. The quality of this corn is the best I have seen in the Philippines. Most of it is being held by the farmers, the price at present being ₱2.50 a cavan or ₱35 a thousand ears. (Report of G. O. Kramer, agricultural inspector, Malolos.)

Zambales.—Owing to the drought during July, plowing and rice planting were much delayed. Though considerable rain fell during August there has been continued complaint of drought; however, nearly all the rice land was planted at the end of August. Only one municipality, San Narciso, has an extensive system of irrigation. Nearly all land in this town is intersected by ditches, but there has been an insufficient amount of water to fill them. A few other towns have small irrigation facilities, some of them reporting about one-third of their lands under irrigation. Rice is the only crop of importance in the province, and all of the municipalities except Olongapo produce a sufficient amount for local consumption, and in good seasons some is exported. Sugar cane does well in a few localities, but little attention is paid to the crop. A little copra is raised in different parts, but not enough to be of commercial importance. Camotes, tomatoes, onions, radishes, lettuce, eggplant, and mustard do well, but little attention is paid to gardening. Zambales is a fine stock province, owing to the great amount of grazing land which in most places is well watered. Large num-

bers of cattle and carabaos are raised here, and nearly every municipality reports a healthy increase in its stock. A few municipalities report that they have not enough animals for field work, owing to the ravages of cattle diseases in past years. Botolan is the best stock town in the province. The report of the municipal secretary, just received, shows that after allowing for all recent losses by rinderpest they still have 2,400 carabaos and 1,420 cattle. (Report of W. K. Howard, veterinarian, Iba.)

Batangas.—In the municipalities of Nasugbu, Balayan, and Calaca the usual acreage of corn and rice has been planted. Native corn has given about an average yield. The seed furnished by the Bureau of Agriculture has met with great success among the farmers and there will probably be a great demand for this variety (Mexican June) next year.

The upland rice crop will not average more than one-half of the usual yield, as it has been cut short by the drought and has not received ordinary care. The reason for this is that the season has been so well adapted to growing sugar cane the landowners have given most of their attention to the production of sugar and neglected the rice crop. The lowland rice, which is grown mostly on land which is unsuitable for any other crop, has received the best of care and an excellent yield is expected.

The large acreage of sugar cane in this section is due to the increased price for this product and the good conditions which have prevailed this season. At Loac, in the municipality of Nasugbu, where no sugar cane was grown at all last year, the indications are that an enormous crop will be harvested this year. A modern sugar central is being installed on the principal "hacienda" in this place, and while the price and the conditions this season have greatly encouraged the farmers, the installation of the sugar central has doubtless been the greatest stimulus. The farmers state that the drought has in no way affected the growth of the sugar cane. Other crops of minor importance are being grown but reliable information as to their progress is not easily available. (Report of J. B. Bell, veterinarian, Lemery.)

Tayabas.—During the month of August there was very little rainfall and as a consequence the crops in some parts of the province are suffering considerably from the drought. In the municipalities of Tiaong, Candelaria, Sariaya, Tayabas, Lukban, and Sampaloc the crops are in fair condition. In the first two or three places several new clearings have been planted to rice. At Lucena, Atimonan, Mauban, Gumaca and Lopez the rice crop has suffered considerably from the drought. At Lucena an

artesian well has just been finished which gives a flow of 30 gallons of water per minute. (Report of W. R. L. Best, veterinarian, Lucena.)

Marinduque, Tayabas.—The drought has been broken and, as a result, the indications are that the rice crop will not be a total failure.

The rice that was planted before the drought is very poor and much of it has become very foul with wild grasses. However, not all of the paddies were planted before the drought and many of them are being planted at this time. It is thought that there will be at least one-half of a normal rice crop on the island. Considerable hemp and copra are being marketed at this time, and owing to the high price of copra the people are giving their coconut groves better attention than formerly and planting more trees. (Report of David E. Kretzer, veterinarian, Boac, Marinduque.)

Albay.—The condition of the crops in the town of Oas during the past month has been favorable. Rice planting will continue during September, October, and November; the seed beds have not been injured by the insects; some of the rice planted in May is being harvested at present. This municipality raises sufficient rice for its own needs. There are about 900 carabaos in the town and by lending them in exchange for farm help all of the farmers succeed fairly well in putting in their crops. Corn is a crop that would assume importance were it not for the inability of the farmers to keep seed or grain in storage. The grain is almost invariably eaten by a boring insect. A box of seed corn if allowed to stand for two weeks or a month is found to be finely ground up and only the shell left with the insect lodged in it. This same insect attacks coffee and cacao beans. It is small, black, has three pairs of legs, and is provided with a prominent bill. (Report of A. G. Frazer, veterinarian, Albay.)

Leyte.—Disease has caused the loss of many animals in the Hinunangan, Panaon, Malitbog, and Ormoc districts. This has affected carabaos, cattle, hogs, and goats. The price of hemp is very low in the interior of Leyte, and those who can do so are now engaged in raising other crops. From Burauen the amount of hemp exported for the quarter ending June 30 was about 1,000 piculs less than for the quarter ending March 31. Tobacco is one of the most promising crops, and one that is daily increasing in production all over this province. It is only lately that they have discovered that certain portions of this province can raise quite as good tobacco as is grown anywhere in the Islands. (Report of the senior inspector of Constabulary for Leyte.)

Cebu.—The principal crops in this province are corn, coconuts, and bananas, all of which are in good condition. Some sugar cane is raised, which is doing well. Tobacco is raised to some extent and corn is planted at all seasons of the year in order to keep a supply on hand. Corn is the principal food staple; very little rice is raised. Weather conditions have been normal and while there have been frequent showers in the mountains but little rain has fallen along the coast. No injury to any of the crops has been reported. (Reports of H. E. Trawver and R. O. Porter, veterinarians, Cebu.)

Bohol.—The principal business of the farmers of this island is rice raising, but the entire crop of the province is not sufficient to meet the needs of the population. Only a part of the available rice lands are cultivated, although there seems to be a sufficient number of farm animals. A very small amount of sugar cane is raised in the northern part of the island, in the vicinity of Tubigon. Abacá is grown in small quantities in the interior of the island. In the extreme northern part, between the towns of Ubay, Sierra Bullones, and Carmen, many hectares of land lie idle where I believe corn would do well if cultivated. Along the eastern and southern coasts coconuts are grown quite extensively, but only a small amount of copra is exported. (Report of Walter A. Korb, veterinarian, Tagbilaran.)

Oriental Negros.—Crop conditions at the close of July were much more favorable than at this time last year, and a larger harvest than last year's is expected. In many parts of the province a larger area has been put under cultivation. Corn is now retailing at ₱5 per cavan; however, it is probable that the crop which will soon be harvested will bring the price down lower than it has been for several years. Locusts have appeared in different parts of the province, but the municipal officials and farmers have been very active in eradicating them. So far as is known none of the crops have been ruined by them.

Live stock has, as a rule, been quite free from any infectious disease. The only case to attract attention was the death of four carabaos in the barrio of Tampa in the municipality of Ayuquitan. A careful investigation showed that none of these animals manifested any symptoms of having rinderpest. Three horses showed characteristic reaction to the mallein test for glanders in the town of Bacong and were immediately placed under strict quarantine pending a second test. Only one case of surra has been reported during the month and this was in a locality where three horses had died from this disease about three months before.

The corn crop on the Island of Siquijor is below the average for this time of year. The "Mexican June" corn is, to all appearances, a decided failure, on account of a little black bug or weevil which has already done serious damage to the crop. The farmers are anxious to learn how they can combat this pest before trying another planting of this variety of seed. With the exception of a very mild distemper among the horses, the animals on Siquijor are in good condition. This distemper seems to have been caused by sudden climatic changes. Preliminary steps have been taken by the officials of the province for improving the live stock. (Report of B. J. Eno, veterinarian, Dumaguete and Siquijor.)

Occidental Negros.—Rinderpest broke out in Hinigaran the first week in June and quite a few animals were lost during the month. At the beginning of July no cases of rinderpest were reported, but a few cases occurred during the month and several animals were lost. With the soldiers furnished by the Constabulary it was possible to maintain a very strict quarantine on all diseased animals, and all animals exposed were injected with serum.

There have been very few locusts noticed during the month, so the strenuous campaign carried on against them has evidently been effective. It is thought that the rice crop will be a failure this year, owing to the scarcity of rain during the planting season. As a result, planting has been confined to the lowlands. Almost everywhere one finds "semilleros" in a wilted condition, and it is believed that not more than one-fourth of the usual amount of rice has been set out. In some parts the people are planting corn to take the place of rice and others are planting camotes. The month has been one of remarkably favorable conditions for the sugar crop. The rainfall was sufficient for the growing cane, with no excess. The end of the month finds the cane in excellent condition, and taking the crop as a whole it is quite advanced for the season. A great many carabaos have been imported into the district and in other ways preparations are being made to plant a large amount of land to sugar cane next year. (Reports of W. A. Mace, agricultural inspector, and Stephen O'Toole, veterinarian, Hinigaran.)

Iloilo.—Agricultural conditions in Iloilo Province as a whole are not very promising, though better in some places than in others. During the entire month of August there was practically no rain. As there had been little rain previously, not much rice has been planted and the rice in the seed beds is nearly all dead or has grown too high for transplanting. In the

municipalities of Balasan, Sara, Passi, and Miagao some rice has been planted, but the rest of the province has practically none planted. Sugar cane is beginning to suffer from the lack of rain, but it is not likely that the rain will hold off long enough to ruin the sugar crop as it has the corn crop. In some towns the officials are trying to persuade the people to plant sweet potatoes to offset the coming shortage in the rice crop.

In Miagao rice planting has been going on steadily during the month and at present most of the available rice land is under cultivation and doing nicely. The lack of rain, which has caused so much loss in other parts of the province has had little effect on the rice in Miagao owing to the fact that the farmers here are able to irrigate their rice lands with water from the mountain streams. As yet no highland rice has been planted. The farmers state that these lands which can not be irrigated for rice are usually reserved for growing corn, which is almost always raised on the hillsides. The harvesting of corn has been completed during the last month.

Sugar cane is grown in Miagao to a very limited extent, aside from what is raised on two small haciendas. Only a small proportion of the cane is in good condition, owing to the lack of proper cultivation. Both of the haciendas have mills run by steam power, but they are old and not in very good condition. Locusts have done no damage to the crops here, as the few which appeared early in the season were successfully destroyed. (Reports of J. A. Thompson, veterinarian, and W. A. Smith, veterinarian, Iloilo.)

Capiz.—In the Province of Capiz a large area is planted in rice and the outlook is promising for the coming year. All the rice fields in the towns of Dumalag, Dumarao, Dao, Panitan, Capiz, and Sapian are planted and the crop is in good condition. Some locusts have been reported, but no serious damage has been done. The province is free from rinderpest. (Report of Jose Gomez, agricultural assistant, Iloilo.)

Antique.—The principal occupation of the people of Antique is raising corn, though they also fish a great deal, especially at night. One crop of corn is raised yearly. It was noticed that those who complained of poor yields were as a rule the farmers who did not work up the soil carefully or exercise care in seed selection and planting, so several experiments were made in order to induce them to improve their methods. On one farm, on which the corn had been very poor, the soil was well prepared and a row of "Mexican June" corn was planted side by side with a row of the seed the farmer usually planted. The difference

was soon apparent, and the people all round were speaking of the big American corn producing three ears to the stalk and the ears larger and much better than the native corn, which, however, was better than usual, owing to the good cultivation given the soil. The same lack of care in connection with rice cultivation was noticed, and, as in the case of corn, a small "cajon," the seed bed in which the rice is first planted, was very carefully cleaned and plowed and later harrowed with the bamboo apparatus commonly used for this purpose. The rice plants in this "cajon" were much stronger and looked far better in every way than the carelessly planted rice in the neighboring fields. The people seemed to be impressed by the results obtained in this work, and it is hoped that future plantings will be made with more care. (Report of J. C. Keefe, assistant agricultural inspector, San Jose.)

Surigao.—The Director of Agriculture has recently been advised by the provincial governor of Surigao that a provincial agricultural and industrial exposition would be held at the provincial capital of Surigao on September 9, 10, 11, 12, and 13. The holding of such agricultural and industrial expositions in different provinces is a most commendable work on the part of the provincial officials and should be loyally supported by the farmers. Such expositions should not only bring together the best products of the farms of the province, but also a large number of the farmers and those engaged in all of the leading industries, who should profit largely by such gatherings.

Moro Province (*Basilan*).—The following extracts are from a very interesting report on the work being done to interest the Moros of Basilan in agriculture and to demonstrate to them the advantages of modern methods of agriculture, by Samuel D. Crawford, deputy governor of Basilan. The report was furnished this office through the courtesy of Capt. John S. Finley, district governor of Zamboanga:

> The first step taken was to secure a post or experiment garden. A strip of low ground lying between the reservation and the stream Boje baroy, on the north, was cleared and prepared for planting. The first seedlings planted, which were coffee, did not thrive on account of the hot, dry weather, but the experiment will be repeated during the rainy season.
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> Florida velvet beans grew extremely well, and pechay, radishes, and bunch beans flourished. The north side of the reservation was dug up by prison labor and planted to corn, sorghum, cotton (Allen long staple), peanuts, and Canada peas for exhibition purposes.
>
> The corn (white sweet) grew rapidly and matured. From the time the ears began to fill there has been a continual fight to keep the wild hogs, monkeys, crows, and white parrots from taking the whole of the crop, but one-third of it has been saved and is being distributed among

the Yakan Moros for immediate planting. The Moro can be interested in a planting enterprise if he can see the thing grow first. This is especially true with cotton, which is now very strong in growth and in full bloom. This cotton (Allen long staple) was planted out of season and may not boll well on account of the wet weather, but it was planned to have it in advance growth for an exhibition at planting time, which is now. The Yakans are very enthusiastic, and all seed furnished by the Bureau of Agriculture has been distributed, even to the Islands of Langhil, Sibago, Salipin, Tapiantana, Pilas, Big, and Little Sangboy, and Lampinigan. It has been the earnest desire of the deputy governor to install one thing at a time, and it is believed from the success with which cotton is grown in northern Luzon that cotton ought to be made one of the principal agricultural products of Basilan. Almost every Moro woman in the tribal ward is a weaver of cloth, used for turbans, ornamental fabrics, and for the clothing of both sexes.

Florida velvet beans appeal to the Moro because they are prolific bearers. Sorghum planted at Sengal has not developed, and others who have planted sorghum have had the same experience. No more seed will be distributed.

The seed of Dapitan papayas has been distributed all over the tribal ward. At Sengal 150 seedlings have been placed on the reservation and all are thriving. The price which the fruit brings in Zamboanga is stimulating the people to respond to the work at Sengal, and many requests are being made for seed.

Young lemon seedlings of the variety "Limones Real" are being sent to all parts of the tribal ward, the Islands of Langhil and Sibago especially, and it is hoped by the end of the month that the distribution may be general. At Sengal 200 young seedlings are being set out on the reservation and in two years should bear testimony to the value of this variety of citrus fruit and the opportunity for its cultivation.

Seeds were given out to Moros at all points touched by the deputy governor on his official trips. The seeds were given to individuals, and many of those who solicited them were Moros, notably Samal women.

It is hoped that what has been done this season may be more than duplicated in the future. Every opportunity has been seized to impress the Moros with the need for enlarging the variety of their crops, and especially in the line of coconut, cotton, and rubber culture.

Mr. Winters (Moro agent) has given Ceara rubber seedlings to all who would avail themselves of the offer, and thousands of small plants or seeds have been taken to all parts of the tribal ward by the Moros. Rubber trees planted less than two years ago at Sengal by Mr. Winters have been a splendid example to the Moros of the rapidity of growth that can be expected from rubber in Basilan.

CURRENT NOTES.

NEW VARIETIES OF SUGAR CANE.

By Dr. G. E. Nesom, *Director of Agriculture.*

Sugar cane is ordinarily propagated by cuttings. In most tropical countries the cutting consists of the top of the stalk, commonly known as "points," and ranges in length from 25 to 50 centimeters. In semitropical and temperate climates, where cane rarely grows to maturity, the entire stalk is planted, as most of the eyes will germinate on immature cane. This system is also followed to some extent in the Hawaiian Islands by cutting the cane before maturity. It was not until a few years ago that any serious attempt was made to propagate sugar cane by the true seeds. The first practical work of this nature, which has had a material bearing on the sugar industry, was done in Demerara by the British officials of the experiment station maintained there. Seeds were carefully collected after the cane had grown to maturity and formed plumes. Great difficulty was experienced in getting the seed to germinate, but finally a few small and very delicate plants were secured and grown to maturity. Most of them were found to differ widely from the parent cane from which the seed was taken. All of those which were selected for trial were given serial numbers preceded by the initial of the country. The resulting canes were grown at first in a small way, and later in field and milling tests. The best-known cane which was produced in this way is now the standard variety in Louisiana, and is still known by its experiment station designation, D74.

When the writer was at the Louisiana Experiment Station in December, 1909, he found that the officials there were importing seeds of many varieties of cane from all over the world, and growing them with a view to securing better varieties. They have adopted the same system of designation, and the numbers of all the varieties are preceded by the letter L.

In January of the present year, while the writer was at the experiment station of the Hawaiian Sugar Planters' Association, he succeded in perfecting arrangements for getting a few specimens of the new varieties of seedling canes which had been originated at that station. This shipment of canes was received by the transport Logan, which arrived in Manila early in July, and included H16, H20, H27, H69, H227, and H309. They consisted of cuttings about 2 feet long which had been carefully selected, cleaned, and disinfected to avoid the introduction of disease here, and the ends coated over with sealing wax to prevent them from withering. They were divided into two lots, one of which was packed in moist charcoal and the others in excelsior, in order to test the comparative merits of these two methods of packing for transportation. As they all arrived in good condition, the experiment showed that either method of packing is successful, and that the cheaper of the two may be used with safety. On arrival in Manila these canes were carefully unpacked, recorded, and photographed, after which they were shipped to the Alabang stock farm near Manila and planted. As they had partly germinated while en route, they came up very promptly and are growing beautifully. The introduction of these varieties of cane may prove to be of material advantage to the sugar industry of these Islands in the future, but there are even greater possibilities of improving the cane grown in the Philippines by undertaking experimental work with the many varieties already here, which are thoroughly acclimated and well known to the people. As sugar cane readily produces seed in these Islands, it will also be practicable to carry on extensive germinating tests with a view to originating new Philippine varieties in the same way as new varieties have been originated in Demerara, Louisiana, and the Hawaiian Islands.

SCHOOL AND HOME GARDENING.

Since the last issue of the REVIEW the Bureau of Education has published a bulletin entitled "School and Home Gardening," which was prepared under the direction of Mr. C. H. Magee, Second Assistant Director of Education, by Mr. S. C. Kelleher, teacher of agriculture in the Philippine Normal School, and Mr. North H. Foreman, supervisor of school gardens for Union Province, assisted by other industrial teachers. In time past the direction of school work in gardening and elementary agriculture has been left largely to the discretion of those locally in charge. Gardening as outlined in this bulletin is now prescribed for all elementary schools in the Philippine Islands. This bulletin, therefore, marks a new era in the work of the Bureau of Educa-

tion, and is a first step in the general introduction of instruction in elementary agriculture. The bulletin states fully the reasons for teaching gardening in the schools. One of the most prominent of these is to stimulate an interest in the study of agriculture, thus paving the way for the solution of many agricultural problems in the Philippines. The bulletin first outlines the four lines of work to be carried on by the schools, namely (1) The School Garden, (2) The Home Garden, (3) Plant Nurseries, (4) Flower and Ornamental Plant Culture. Under the discussion of the school garden the following subjects are treated: (*a*) selecting a site, (*b*) fencing, (*c*) planning and plotting the entire garden, (*d*) preparing the soil for planting, (*e*) planning and mapping the pupil's plot, (*f*) choosing plants and seeds, (*g*) keeping a record, (*h*) tools, (*i*) transplanting, (*j*) when to start a garden, (*k*) care of plants, (*l*) disposition of products, (*m*) the germinating bed, (*n*) cultural directions for some of the common vegetables, (*o*) seed for the next crop, (*p*) how to keep seeds until planting time. Some paragraphs are also devoted to barrio schools, decorative gardening, a lesson in tree planting, and a plan of an individual garden. The bulletin concludes with a report by Mr. Foreman on the school garden work in Union Province.

AGRICULTURE IN THE LOCAL PRESS.

In its numbers of August 31 and September 7, El Ideal devoted almost a whole page to the discussion of subjects pertaining to agriculture. It is announced that on each Wednesday a page will be devoted to subjects of interest to the farmers of the country. In the issue of August 31 considerable space was given to the discussion of the weather and crop conditions, irrigation, drainage, animal diseases, sugar, copra, and fiber-stripping machines, while that of September 7 contains articles on the labor question, sugar centrals, etc. This very commendable action on the part of El Ideal should be of great assistance to the farmers, and it is one that might well be followed by other local papers.

PROVINCIAL EXPOSITION IN ILOCOS SUR.

According to La Democracia of September 7, the Hon. Manuel Singson, governor of the Province of Ilocos Sur, has called upon the people of that province, including the subprovince of Abra, to take part in a provincial fair and exposition of the industrial, agricultural and commercial products of the province, to be held on January 25, 1911. This fair is to be held for the purpose of stirring up interest in the development of local industries, and for selecting exhibits to be sent to the next Carnival.

In speaking of the benefits of such an exposition, Governor Singson states that it is hoped to bring about more friendly relations between the people from different parts of the provinces and establish a feeling of fraternity; to have an exchange of ideas, aspirations and ideals between those interested in the development of agriculture and the extension of the trade of the province; and to give the general public a better idea of their natural resources and the importance of their products. Speaking of the thrift and enterprise of the Ilocanos, the governor very aptly quotes Secretary Dean C. Worcester, of the Department of the Interior, who has called them the "yankees" of the Philippines.

THE AGRICULTURAL ASSOCIATION OF BULACAN.

Under the supervision of a general board of directors, composed of Sr. Mariano Crisóstomo as president, Sr. Teodoro Sandiko as vice-president, Sr. Eladio Adriano as treasurer, and Hermogenes Reyes, Albino Camacho, and Ambrosio Marasigan as members, the farmers of the Province of Bulacan have formed a very complete organization which includes an agricultural committee for every town in the province. Commenting on this organization the editor of Plaridel speaks very enthusiastically of the association and says that every farmer in Bulacan Province is responsible for the success of its work.

LECTURES TO FARMERS.

Mr. M. M. Saleeby, fiber expert of the Bureau of Agriculture, has recently returned to Manila from a trip through the Provinces of La Union, Ilocos Sur, and Ilocos Norte. This trip was made for the purpose of investigating the conditions relative to the maguey industry and for giving suggestions and instructions to the maguey planters.

In connection with this work Mr. Saleeby gave a series of twelve lectures, nine of which were illustrated by the use of a stereopticon. All of these lectures were well attended and the greatest enthusiasm was shown. After each lecture the audience was invited to question the speaker and all phases of the industry were discussed. It is estimated that at least 1,000 farmers, in addition to many students and others, attended this series of lectures.

NOTES FROM OTHER FIELDS.

RULES GOVERNING THE IMPORTATION OF ANIMALS INTO AUSTRALIA.

In connection with the new policy of the Government of the Philippine Islands in regard to excluding diseased animals, the following rules[1] governing the importation of animals into Australia are of interest:

Fourteen days' notice of the arrival of the animal shall be given by the importer to the chief quarantine officer of the State.

The master of any vessel on which any animal is being imported from any country, except New Zealand, shall immediately on arrival at the landing port, give notice of arrival to the chief quarantine officer, and shall also forward to him a declaration that no disease affecting animals has occurred during the voyage, or giving particulars as to any disease which has occurred, and also particulars regarding other stock carried on the vessel during the voyage.

The owner or consignor of any imported animal or animal to be imported shall forward with any such animal, to be delivered to the chief quarantine officer prior to the landing of the animal, declarations, certificates, notices, and permits, as follows:

In case of any horse, ass, or mule from the United States of America or Canada:

1. A declaration from the owner certifying (*a*) that the animal has been free from disease during the six months next preceding shipment; (*b*) that it has not been in contact with any animal suffering from disease during the six months next preceding shipment; (*c*) that it has not, otherwise than as required under 3, been tested with mallein during the thirty days next preceding; (*d*) that it has not been during the twelve months next preceding in any State or province in which dourine (maladie du coit) or epizoötic lymphangitis is declared or known to exist.

2. Certificates from Federal and State veterinary surgeons to the effect that dourine (maladie du coit) or epizoötic lymphangitis neither is, nor during the twelve months next preceding the shipment of the animal has been, declared or known to exist in the State from which the animal is declared by the owner to have been exported or in which it is declared to have been during the twelve months next preceding shipment.

3. A mallein-test certificate by an approved veterinary surgeon. This certificate shall *inter alia* state the date on which the test was applied.

4. A certificate of general health from an approved veterinary surgeon

[1] Published in the "Monthly Consular and Trade Reports," June, 1910 (Part II).

at port of shipment, who shall also indorse the mallein-test certificate to the effect that, after due inquiry, he has no reason to doubt its correctness.

In the case of any cattle from the United Kingdom, United States of America,[1] and Canada:

1. A declaration from the owner certifying (*a*) that the animal has been free from disease during the six months next preceding shipment; (*b*) that it has not been in contact with any animal suffering from disease during the six months next preceding shipment; (*c*) that it has not, otherwise than as required under 2, been tested with tuberculin during the two months next preceding shipment.

2. A tuberculin-test certificate signed by a qualified veterinary surgeon. Such certificate shall *inter alia* state the date on which the test was applied.

3. A certificate of general health from an approved veterinary surgeon at the port of shipment, who shall also indorse the tuberculin-test certificate to the effect that, after due inquiry, he has no reason to doubt its correctness.

In the case of any swine from New Zealand, the United Kingdom, the United States of America, or Canada:

1. A declaration from the owner certifying (*a*) that the animal has been free from disease during the six months next preceding shipment; (*b*) that it has not been in contact with any animal suffering from disease during the six months next preceding shipment.

2. A certificate of its general health from an approved veterinary surgeon at the port of shipment.

In the case of any dog from any country from which dogs are admissable, other than New Zealand:

1. A declaration from the owner certifying (*a*) that the animal has been free from disease during the six months next preceding shipment; (*b*) that it has not been in contact with any animal suffering from disease during the six months next preceding shipment.

2. A certificate of its general health from an approved veterinary surgeon at the port of shipment.

In the case of circus or other performing animals of the several kinds permitted to be imported, the declarations, certificates, notices, and permits shall be those required in respect of the same kind of animal generally.

Every imported animal shall be examined by a government veterinary surgeon, who shall certify to its general health.

THE SECOND NATIONAL CONSERVATION CONGRESS.

The Bureau of Agriculture is in receipt of an announcement regarding the "Second National Conservation Congress," to be held at St. Paul, Minnesota, September 5 to 9 of this year. The objects of the Congress are stated in the pamphlet as follows:

1. To provide for discussion of the resources of the United States as the foundation for the prosperity of the people.

[1] At the time of the publication of the Quarantine Regulations of 1909 the importation of cattle, swine, sheep, and goats from the United States was prohibited, and the regulations quoted above are those which apply to such animals imported from the United Kingdom and Canada. The prohibition was removed by the proclamation of January 18, 1910.

2. To furnish definite information concerning the resources and their development, use, and preservation.

3. To afford an agency through which the people of the country may frame policies and principles affecting the conservation and utilization of their resources to be put into effect by their representatives in State and Federal governments.

The officers of and delegates to the Conservation Congress are given, also, and to indicate how thoroughly representative of the entire nation it is intended to be, we give the list below:

OFFICERS AND DELEGATES.

Officers of the National Conservation Congress.

Fifteen delegates appointed by the governor of each State and Territory.

Five delegates appointed by the mayor of each city with a population of 25,000 or more.

Two delegates appointed by the mayor of each city with a population of less than 25,000.

Two delegates appointed by each board of county commissioners.

Five delegates appointed by each national organization concerned in the work of the congress.

Five delegates appointed by each State or inter state organization concerned in the work of the congress.

Three delegates appointed by each chamber of commerce, board of trade, commercial club, or other local organization concerned in the work of the congress.

Two delegates appointed by each State or other university or college, and by each agricultural college or experiment station.

The honorary members include the President of the United States, the Vice-President, members of the Cabinet, members of Congress, representatives of foreign governments, governors of the States and Territories, and practically all officials who would be interested in conservation by reason of their positions, as well as those actively engaged in the work.

Since there has been so much interest expressed by foreign nations in the conservation movement in the United States, an invitation was extended to each of the forty-five countries which participated in the recent International Peace Conference, to send representatives to the Congress.

The program was not given in the announcement, but it was stated that ex-President Roosevelt was to address the Congress, as well as many other men of notable achievement, and ample opportunity for discussion was promised. It would seem that such a congress, representing as it does the interests of the nation as a whole, should accomplish a great deal for the conservation movement, which is being rapidly recognized as of vital importance to the country's future welfare.

THE AGRI-HORTICULTURAL SHOW AT SINGAPORE.

The Agri-Horticultural Show held at Singapore, August 17 to 20, appears from all accounts to have been a decided success. Most enthusiastic reports have come to us, especially in regard to the Philippine exhibit.

The Agri-Horticultural Show has been held regularly for the past seven years, in one form or another, but only in the last two or three years has it attracted much attention. Now, however, it is spoken of as one of the most successful public enterprises undertaken by the Government.

The show this year was opened, as usual, by the governor-general, who made an address of some length, in which he reviewed the agricultural situation and prospects, and outlined in general the attitude of the Government toward the control and development of agricultural interests. In the course of his address, when speaking of the rubber industry, the governor stated that on the Malay Peninsula to-day there are 400,000 acres (160,000 hectares) planted in rubber, and it is expected that the exportation this year will exceed 60,000 tons. He considers the outlook for the future very bright, and warned the planters that the day is not far distant when the competition will no longer be so strong between plantation rubber and that from the indigenous forests of Brazil and Africa, but will center among the plantations, and science and skill in cultivation will be the determining factors. Labor, he stated, was the greatest want on the peninsula. The enormous tracts of land recently placed under cultivation have more than used up the supply of labor, and it is now necessary to import coolies from all available sources. Most of the labor now imported comes from India, and consists of Tamil coolies, but as these are inclined to be sickly and the mortality rate is high, the results are not very satisfactory. At present labor agencies are recruiting coolies from China and Java, with every prospect of success.

The exhibit sent to the show from the Philippines received very friendly and cordial mention from the governor, and the Singapore Free Press comments upon it as follows:

> People were much surprised and also very pleased to see a very fine entry from the Philippine Islands. This was sent in by the Philippine Government at the request of the American consul-general at Singapore. The exhibits were got ready in three days and were dispatched to the show in charge of Mr. A. W. Prautch. The exhibition is a very creditable one and shows the fiber, forestry, and tobacco interests of the Islands. There is also an abundance of "boost" literature on the Philippines for distribution. There are hemp (abacá) pieces 24 feet long and cloth woven from it

is also shown. Singaporeans will be particularly interested in the pineapple fiber (piña). It has a silky gloss and makes a very delicate cloth not unlike veiling. The maguey (sisal) fiber is 6 feet long, and cloths made from it are also shown. Miniature bales of hemp are shown in various commercial qualities. There are also ropes on exhibition. The Forestry Bureau has 168 pieces of wood on show, and some very fine samples of gum copal and gutta-percha. There is also a sample of cotton (Caravonica) that is an invented hybrid production. This was grown at the Abucay plantation, 30 miles from Manila.

Mr. Prautch, in writing to this city, states that he was received with every courtesy by the Singapore officials, and that the people came in great numbers to see the exhibit. A silver medal was awarded the exhibit for its general excellence, although there was no attempt at competition. Its success was far beyond his expectations.

SUGAR IN JAVA AND BRITISH GUIANA.

The great strides made by the sugar industry in Java, as compared with that in British Guiana and the West Indies, have been much commented upon recently by various authorities. Some of the statements made will prove of interest to sugar planters in the Philippines, since the industry here is of ever-increasing importance and modern methods are superseding the antiquated ones so long in use.

Sugar planters in Java have utilized modern scientific methods wherever possible, and it is this fact that has caused them to forge ahead with increasing success, while less progressive planters in other localities have remained more or less stationary.

In British Guiana, for instance, the output of sugar has not increased at all since 1894, and there have been no notable improvements in cultivation. The disease that attacked the Bourbon cane and swept through the plantations has been responsible for much loss. Then, too, the cane is grown year after year on the same soil, which becomes exhausted and yields an inferior product. The drainage systems which are necessary are expensive, and labor has to be imported in great quantities. From all accounts, the trouble in the West Indies, and especially in British Guiana, seems not to be that the planters are unwilling to spend money on their estates, but that they adhere to inferior systems of cultivation.

In Java, on the contrary, the sugar industry has increased with great strides. The plantations there were also visited by disease (sereh) which was quite as serious as that which attacked the cane in British Guiana. But here nurseries were at once established from which perfectly sound canes were obtained

for planting. Then by scientific cross-fertilization suitable varieties were propagated, which were proof against the disease. In Java the land is planted in sugar only once in three years, and the cane is cut at eighteen months. Varieties, also, are chosen for their adaptability to the different soils. As a result of intensive cultivation, rational manuring, and judicious selection of plants, the yield of cane in proportion to the area has increased wonderfully especially, in the past seven years. In 1908 there were 117,579 hectares of land under sugar cultivation, and the crop amounted to 1,242,000 tons. The elaborate irrigation works in Java will, it is estimated, increase the area planted to sugar so that the total yield in the course of a few years will increase to 1,500,000 or 1,600,000 tons.

Though the amount of cane produced per hectare has so greatly increased in Java, the proportion of sugar extracted from the cane has not increased, though the quality has improved. Another interesting fact is that while in 1894 there were 195 sugar factories in Java, in 1908 there were only 178, although the production of sugar had in the meantime more than doubled. This would indicate that the Javanese planters are convinced of the value of concentration and conducting operations on a large scale.

MARKET REPORTS.

NEW YORK AND LONDON FIBER MARKET.

Compiled by M. M. SALEEBY, *Fiber Expert.*

The following quotations on Manila hemp and sisal are taken from the report of Messrs. Hanson & Orth, dated New York and London, July 31, 1910:

MANILA HEMP.[1]

	Spot flat.	Shipment. August to September.	Flat. October to November.
Superior good current	9¼	8¾	8¾
50 per cent over good current	8⅞	8⅛	8⅛
Good current	8¼	8	8
Midway	7⅞	7⅛	7⅛
25 per cent over current	6	5¾	5¾
Fair current	5⅜	5⅛	5⅛
Superior seconds	5	4⅞	4⅞

Lowest shipment price for current for the month, 5⅛ cents; highest shipment price for current for the month, 5⅜ cents.

SISAL.

Market quiet, flat, spot 4⅞ cents; shipment 4⅞ cents. Lowest shipment price for the month, 4⅞ cents; highest shipment price for the month, 4⅞ cents.

MAGUEY FIBER.[2]

This fiber is neglected, and values are nominally 4¼ cents for No. 1 and 4 cents for No. 2, Manila maguey. Cebu maguey is obtainable at ¼ cent more.

[1] Quotations are given in cents, United States currency, per pound.

[2] From the report of Messrs. Smith & Schipper, dated New York, August 1, 1910.

NOTES ON MANILA MARKETS FOR AUGUST.

By KER & Co.

Based on advices

From—	Date	From—	Date.
San Francisco	July 23	Iloilo	Aug. 23
London	July 29	Hongkong	Aug. 26
Singapore	Aug. 16	Cebu	Aug. 27

SUGAR.

Manila.—Nothing new to report.

Iloilo.—There have been no transactions since our last report, and there is nothing new to report, crop being almost over. We quote No. 1 at ₱8.75 per picul [1] bases assorted, sellers no buyers. Market closes weak.

Cebu.—Nothing new to report.

HEMP.

Since our last report market for lower grades has been dull and a few transactions were reported at reduced prices. Market closes with a better tone, however, and we quote Fair Current (Albay quality) at ₱8.25 to ₱8.50 per picul. The finer qualities have been in good request, and in some cases advanced prices have been paid. Receipts at all ports for the eight months ending to-day were 909,164 bales, as against 850,686 bales for the corresponding period of 1909 and 651,153 bales in 1908.

COPRA.

Market for "Fair Merchantable" opened firm in sympathy with favorable European advices. As high as ₱11.375 per picul was paid for good parcels, but as we close values have receded to ₱11 per picul, market ruling quiet but firm. Cebu f. m. s. keeps steady at the equivalent of about £21/10- per ton f. o. b.

Distribution of principal Philippine exports for the eight months, January to August, 1910.

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Malay States and India.
Dry sugar ____tons__	75,682	14,057	12,932					
Hemp ____bales__	406,780	9,661	34,752	316,616	45,491	13,904	10,943	7,336
Copra ____piculs__	5,600		51,520	14,400	954,048		3,219	
Cigars ____million__	33,905	25,569	21,598	5,223	13,163	9,388	327	11,465

[1] 1 picul equals 63¼ kilograms.

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING DECEMBER 31, 1909.

Previous crops statistics have been compiled from the municipalities only, the reports from which had been received at the time of publishing, a note having been made of how many municipalities had been heard from in each province. It was impossible under that plan for the reader to know whether the missing municipalities were those which produced much or little. Beginning with the present report an estimate will be made in the case of municipalities which are missing so that the figures given will be approximately correct for each entire province.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		Hectares.	*Hectares.*		
Agusan:					
Rice	Fair		940	660,000	Liters.
Abacá	do		220	135,165	Kilos.
Copra	Good			77,165	Do.
Corn	do		210	225,000	Liters.
Albay:					
Rice	do	5,199	3,193	3,015,000	Do.
Abacá	Fair	1,372	11,285	2,796,978	Kilos.
Copra	Good			433,073	Do.
Sugar cane	Fair	30	88	19,670	Do.
Corn	do	115	243	176,700	Liters.
Ambos Camarines:					
Rice	do	6,977	6,592	7,335,975	Do.
Abacá	do	355	5,047	1,303,256	Kilos.
Copra	Good			265,018	Do.
Sugar cane	do	33	41	8,855	Do.
Corn	Fair	131	213	105,600	Liters.
Antique:					
Rice	Good	10	19,231	21,162,225	Do.
Abacá	do	154	42	35,293	Kilos.
Copra	do			17,520	Do.
Sugar cane	do	35	18	28,273	Do.
Corn	Fair	164			
Bataan:					
Rice	do	266	3,758	3,611,175	Liters.
Sugar cane	Good	18			
Corn	Fair	28			
Batangas:					
Rice	do	460	13,212	8,220,975	Do.
Abacá	do		55	9,677	Kilos.
Sugar cane	do		2	7,590	Do.
Corn	Good	2,473	10	3,750	Liters.
Coffee	Fair		157	8,970	Kilos.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Bohol:		*Hectares.*	*Hectares.*		
Rice	Fair	13,698	14,601	16,164,975	Liters.
Abacá	do	7	349	202,653	Kilos.
Maguey	Good	19	66	87,601	Do.
Copra	Fair			492,907	Do.
Sugar cane	do	24	30	22,011	Do.
Corn	do	1,936	3,893	3,284,325	Liters.
Bulacan:					
Rice	do	840	23,165	33,283,075	Do.
Sugar cane	do	160			
Tobacco	do	1,050			
Corn	do	1,439	1	1,200	Do.
Cagayan:					
Rice	do	3,535	4,241	4,992,900	Do.
Sugar cane	do	127	7	5,819	Kilos.
Tobacco	do	1,785	236	109,234	Do.
Corn	do	1,274	435	780,000	Liters.
Coffee	do	20	4	230	Kilos.
Capiz:					
Rice	do		52,101	56,169,750	Liters.
Abacá	do	192	280	141,680	Kilos.
Copra	do			136,114	Do.
Sugar cane	do	28	70	38,772	Do.
Corn	do	330	139	126,750	Liters.
Cavite:					
Rice	do	1,658	3,793	3,255,750	Do.
Abacá	do	49	268	60,087	Kilos.
Copra	do			3,605	Do.
Sugar cane	do	7	95	47,311	Do.
Corn	do	443	4	1,825	Liters.
Cebu:					
Rice	do	1,578	2,554	2,507,400	Do.
Abacá	do	68	1,246	1,795,488	Kilos.
Maguey	Good	110	644	374,440	Do.
Copra	do			896,948	Do.
Sugar cane	do	405	250	162,236	Do.
Tobacco	Fair	3,124	38	48,438	Do.
Corn	do	13,067	18,358	14,049,450	Liters.
Ilocos Norte:					
Rice	do	5	25,640	35,175,900	Do.
Sugar cane	do	670	494	725,730	Kilos.
Tobacco	do	883	58	20,930	Do.
Corn	do	129	107	65,400	Liters.
Ilocos Sur:					
Rice	do	298	28,200	37,598,175	Do.
Maguey	do	29	375	192,849	Kilos.
Copra	do			5,692	Do.
Sugar cane	do	188	186	221,501	Do.
Corn	do	711	195	171,125	Liters.
Iloilo:					
Rice	do	2,690	31,219	33,160,875	Do.
Abacá	Good		175	76,469	Kilos.
Copra	do			106,703	Do.
Sugar cane	Fair	311	216	501,216	Do.
Tobacco	do	112			
Corn	do	523	632	443,850	Liters.
Isabela:					
Rice	do	2	659	129,375	Do.
Tobacco	do	7,793	3,747	2,383,306	Kilos.
Corn	do	1,786	2,615	272,525	Liters.
La Laguna:					
Rice	do	1,168	3,670	4,747,425	Do.
Abacá	Good		548	115,241	Kilos.
Copra	Fair			4,307,388	Do.
Sugar cane	do	58	35	127,448	Do.
Corn	do	131	358	271,025	Liters.
La Union:					
Rice	do	150	46,838	42,155,625	Do.
Copra	Good			34,218	Kilos.
Sugar cane	Fair	118	87	79,632	Do.
Corn	Good	124	149	73,350	Liters.
Leyte:					
Rice	do	7,256	18,714	14,833,875	Do.
Abacá	do	11,570	11,972	6,002,172	Kilos.
Copra	do			1,081,385	Do.
Sugar cane	Fair	44	144	227,700	Do.
Tobacco	do	387	83	62,284	Do.
Corn	do	2,026	1,616	1,830,975	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
					Liters.
Mindoro:		*Hectares.*	*Hectares.*		Kilos.
Rice	Good		2,150	3,284,250	
Abacá	do		189	115,874	
Copra	do			96,140	Do.
Tobacco	Fair	97	4	4,600	Do.
Corn	do	105	15	1,477	Liters.
Misamis:					
Rice	do	300	1,489	1,596,975	Do.
Abacá	do	110	2,355	1,439,190	Kilos.
Copra	Good			463,306	Do.
Tobacco	Fair	87	24	23,276	Do.
Corn	do	610	250	375,000	Liters.
Moro:					
Rice	Good	346	1,991	2,737,350	Do.
Abacá	do	117	927	703,846	Kilos.
Copra	Fair			955,265	Do.
Sugar cane	Good	26	17	15,560	Do.
Corn	do	127	84	112,350	Liters.
Coffee	do		6	7,107	Kilos.
Mountain:					
Rice	Fair	763	6,157	6,050,100	Liters.
Tobacco	do	121			
Corn	do	140	6	9,000	Do.
Coffee	do		50	2,221	Kilos.
Nueva Ecija:					
Rice	Good	376	33,993	69,508,500	Liters.
Sugar cane	do	53	151	125,172	Kilos.
Tobacco	do	618	187	163,760	Do.
Corn	do	235	74	49,500	Liters.
Nueva Vizcaya:					
Rice	Fair		260	393,750	Do.
Corn	Good	30			
Occidental Negros:					
Rice	Fair	3,300	14,120	20,902,725	Do.
Copra	do			343,953	Kilos.
Sugar cane	do	4,880	3,496	4,830,782	Do.
Tobacco	do	866	60	16,238	Do.
Corn	do	1,786	1,837	2,816,025	Liters.
Cacao	Good		21	5,980	Kilos.
Oriental Negros:					
Rice	Fair	927	1,026	1,237,800	Liters.
Abacá	Good	150	751	434,527	Kilos.
Copra	do			1,014,476	Do.
Sugar cane	Fair	202	491	1,213,072	Do.
Corn	do	2,952	3,033	4,049,025	Liters.
Cacao	Good	20	73	25,162	Kilos.
Palawan:					
Rice	Fair	500	1,774	1,942,125	Liters.
Abacá	Good	1,305			
Copra	do			6,704	Kilos.
Corn	Fair		124	139,500	Liters.
Pampanga:					
Rice	do	7,457	35,239	39,528,000	Do.
Sugar cane	Good	3,072	3,341	5,991,672	Kilos.
Corn	Fair	168	6	12,000	Liters.
Pangasinan:					
Rice	do	8,292	109,707	164,640,525	Do.
Maguey	Good	5	50	6,831	Kilos.
Copra	Fair			110,624	Do.
Sugar cane	do	237	1,187	1,183,850	Do.
Tobacco	do	1,545	290	178,480	Do.
Corn	Good	716	1,374	962,025	Liters.
Rizal:					
Rice	Fair	260	9,562	17,909,100	Do
Sugar cane	do	5	10	3,795	Kilos.
Corn	do	232	83	53,700	Liters
Samar:					
Rice	do	4,368	7,485	5,396,925	Do
Abacá	do	968	3,536	2,459,603	Kilos.
Copra	do			1,189,732	Do
Sugar cane	Good	267	106	29,285	Do
Corn	do	607	261	164,765	Liters.
Sorsogon:					
Rice	do	3,059	3,395	5,061,600	Do
Abacá	do	269	11,579	2,132,474	Kilos.
Copra	do			312,898	Do
Sugar cane	Fair	44	46	22,137	Do
Corn	do	281	361	109,800	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Surigao:		*Hectares.*	*Hectares.*		
Rice	Good		1,671	2,073,000	Liters.
Abacá	do	73	422	768,108	Kilos.
Copra	do			69,955	Do
Tobacco	do		22	6,440	Do
Corn	do		465	472,500	Liters.
Tarlac:					
Rice	Fair	168	30,246	60,233,475	Do
Sugar cane	do	210	122	116,380	Kilos.
Tobacco	Good	69			
Corn	Fair	382	35	7,500	Liters.
Tayabas:					
Rice	Good	5,188	9,651	11,332,050	Do
Abacá	do	5	1,624	1,171,074	Kilos.
Copra	do			1,730,393	Do
Tobacco	do	99			
Corn	do	168	6	2,250	Liters.
Zambales:					
Rice	Fair	36	8,683	15,168,600	Do
Sugar cane	Good	10	44	42,883	Kilos.
Corn	do	6	5	6,000	Liters.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abacá, copra, sugar, tobacco, and corn for the months of January and February, 1910.

JANUARY.

[NOTE.—75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba.]

Province.	Unhulled rice per 75 liters.		Abacá per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱2.50	₱2.00	₱9.17	₱6.30	₱9.00	₱8.85					₱2.75	₱1.50
Albay	3.50	2.00	12.00	7.50	9.50	6.60					4.00	1.50
Ambos Camarines	4.50	2.00	10.00	5.00	12.00	5.00	₱8.00	₱6.00			5.00	1.50
Antique	3.00	1.75	15.00	12.00	7.50	6.00	5.00	4.00	₱22.00	₱15.00	2.00	1.00
Bataan	3.00	2.00					8.00	5.00			4.00	2.00
Batangas	3.50	2.00	12.00	8.00			9.00	4.00	15.00	6.00	5.00	2.00
Bohol	3.75	2.00	12.50	5.00	10.25	7.00	8.00	4.00	20.00	4.00	4.00	2.50
Bulacan	2.50	1.75					9.00	7.00	15.00	8.00	3.60	1.50
Cagayan	4.00	2.00							20.00	8.00	3.00	1.00
Capiz	3.75	1.50	16.00	7.00	9.50	6.00	7.50	5.00	20.00	7.00	3.00	1.00
Cavite	3.75	2.40	15.00	14.00			8.00	5.75			3.00	1.25
Cebu	3.75	2.50	15.50	8.00	11.20	6.00	8.00	5.00	20.00	4.00	5.00	2.25
Ilocos Norte	3.50	2.00					8.00	3.00	20.00	4.00	3.00	2.50
Ilocos Sur	4.00	2.00			10.00	5.00	7.00	3.00	25.00	5.00	4.00	1.50
Iloilo	3.00	1.25	16.00	12.00	11.30	7.00	8.00	6.00	20.00	5.53	3.25	1.20
Isabela	3.75	3.12							20.40	10.00	5.00	2.50
La Laguna	3.50	2.50	12.00	7.59	9.00	6.32	7.00	5.00			4.00	2.00
La Union	4.50	1.50			8.00	6.00	7.50	3.50	9.50	7.50	4.50	2.50
Leyte	3.50	2.25	13.75	8.22	10.00	4.80	9.71	4.50	22.50	4.50	4.00	2.00
Mindoro	3.75	1.75	13.00	9.00					30.00	12.00	3.12	1.50
Misamis	3.25	2.50	12.50	6.95	10.50	8.82	8.00	5.50	20.00	5.00	3.50	2.00
Moro	2.50	1.80	15.00	8.66	10.00	6.50	5.00	4.00	27.00	27.00	3.50	2.00
Mountain	7.50	2.00			8.00	3.00	5.00	3.50	10.00	3.50	6.25	3.00
Nueva Ecija	3.00	1.25					8.00	4.00	23.00	7.50	3.00	1.25
Nueva Vizcaya	3.50	3.12							20.00	11.00	4.00	2.12
Occidental Negros	3.00	2.00	15.00	10.00	10.00	6.00	7.50	5.50	22.00	5.00	3.00	1.50
Oriental Negros	4.12	2.50	12.50	8.00	10.80	7.00	7.50	4.00	20.00	6.00	5.00	2.50
Palawan	3.00	2.50			7.00	6.00					1.50	1.50
Pampanga	2.50	2.00					7.50	6.00			3.75	2.50
Pangasinan	3.50	1.00			10.00	4.00	8.50	5.00	20.00	6.00	4.00	1.50

Rizal	2.75	2.00					9.50	7.00			3.00	1.00
Samar	3.75	2.25	14.00	8.85	9.50	5.75			25.00	6.00	5.00	2.00
Sorsogon	3.75	2.50	11.12	7.00	9.16	5.50	8.00	7.00			3.00	1.50
Surigao	3.50	2.00	12.00	8.50	9.50	6.93					2.50	1.20
Tarlac	3.75	1.50					8.00	5.80	12.00	9.00	2.50	2.25
Tayabas	4.50	2.50	14.00	6.00	10.00	5.50	6.40	5.00	15.00	6.00	5.00	2.50
Zambales	3.25	1.50			10.00	7.00	9.00	4.00	18.00	4.00	5.00	2.00

FEBRUARY.

Agusan	₱3.00	₱2.25	₱9.35	₱6.30	₱9.70	₱9.40					₱2.75	₱2.00
Albay	3.50	2.00	12.00	6.40	9.50	6.00					4.00	1.50
Ambos Camarines	4.00	2.00	9.48	5.00	12.50	5.00	₱8.00	₱6.00			4.50	2.00
Antique	3.12	1.75	15.00	11.00	7.50	6.00	6.50	4.50	₱22.00	₱15.00	2.00	1.25
Bataan	3.00	2.00					8.00	6.00			4.00	2.00
Batangas	4.20	2.50	12.00	8.00			8.00	4.50	12.50	6.00	5.00	2.00
Bohol	3.75	2.00	14.00	5.00	12.00	7.05	8.00	4.25	20.00	4.50	3.75	2.50
Bulacan	2.60	2.00					9.50	7.50	15.00	8.00	3.25	1.50
Cagayan	3.75	2.00							20.00	8.00	5.00	1.00
Capiz	3.75	1.50	16.00	7.00	9.50	6.00	7.50	6.00	20.00	6.00	3.00	1.00
Cavite	3.50	2.40	17.00	15.00			9.40	5.25			3.75	1.50
Cebu	4.00	2.50	15.00	8.50	11.25	6.00	8.00	5.00	20.00	4.00	5.00	2.50
Ilocos Norte	4.00	2.10					8.00	3.00	20.00	4.00	3.00	2.50
Ilocos Sur	4.50	2.00			10.00	5.00	8.00	3.00	25.00	5.00	4.00	1.50
Iloilo	3.50	1.25	18.50	12.00	11.50	8.00	9.00	6.00	23.00	5.53	3.25	1.20
Isabela	3.75	3.12							20.40	10.00	5.00	3.00
La Laguna	3.50	2.25	12.00	7.00	8.50	6.00	9.00	6.50			4.00	2.00
La Union	5.00	1.50			8.00	6.00	6.00	3.00	9.50	4.00	4.50	2.00
Leyte	4.00	2.25	13.75	9.00	10.00	4.80	9.00	4.50	22.50	4.50	4.00	2.00
Mindoro	3.60	2.00	12.00	9.00					30.00	12.00	3.12	2.00
Misamis	3.50	2.00	12.50	6.75	10.75	8.85	8.00	6.75	25.00	5.00	3.50	2.00
Moro	2.50	1.80	14.00	8.25	10.00	7.00	5.00	5.00	27.00	27.00	3.50	2.00
Mountain	8.00	2.00			8.00	3.00	4.50	3.00	10.00	4.00	6.25	2.50
Nueva Ecija	2.77	1.50					9.00	6.00	23.00	7.50	2.50	1.25
Nueva Vizcaya	4.00	2.00							21.00	11.00	3.00	2.50
Occidental Negros	3.00	2.25	16.00	10.00	10.00	6.00	8.00	7.00	23.00	6.00	3.00	2.00
Oriental Negros	4.12	2.50	12.50	7.70	10.90	7.00	8.50	4.00	20.00	6.00	5.00	2.60
Palawan	3.00	3.00			7.00	6.00					1.50	1.50
Pampanga	2.50	2.10					7.50	6.00			3.75	2.50
Pangasinan	3.50	1.50			10.00	5.00	9.00	5.00	20.00	6.00	4.00	1.50
Rizal	2.75	2.00					9.52	7.00			3.50	2.00
Samar	3.75	2.25	14.00	8.15	9.50	6.00			25.00	6.00	5.00	2.00
Sorsogon	3.75	2.50	11.25	6.30	9.16	5.50	8.00	8.00			3.00	1.50
Surigao	3.50	2.00	12.50	9.00	11.00	7.56					2.50	1.50
Tarlac	3.50	1.80					8.00	5.80	12.00	9.00	2.50	2.25
Tayabas	5.00	2.50	14.50	5.50	9.14	5.00	6.40	5.00	13.00	6.00	5.00	2.50
Zambales	3.25	1.50			10.00	7.00	9.00	4.00	18.00	4.00	4.00	1.80

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

JULY, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	10,826,822	4,046,195	2,798,709	198,863	218,866	3,088		18,092,543
	Value	Dollars	321,539	129,189	77,514	7,613	7,526	105		543,486
Beef cattle	Quantity	Number	2,425		117					2,542
	Value	Dollars	52,520		1,369					53,889
Sugar	Quantity	Kilos	195,799	14,213	20,884	9,203	4,776	103		244,978
	Value	Dollars	13,896	1,032	1,488	682	368	12		17,478
Coffee	Quantity	Kilos	23,058	5,666	1,758	609	1,987	12		33,090
	Value	Dollars	4,868	1,710	350	162	489	4		7,583
Cacao	Quantity	Kilos	32,416	16,526						48,942
	Value	Dollars	7,190	4,461						11,651
Eggs	Quantity	Dozen	324,022		83	34	240			324,379
	Value	Dollars	22,562		7	3	12			22,584
Raw cotton	Quantity	Kilos								
	Value	Dollars								

EXPORTS.

Hemp	Quantity	Kilos	11,664,882	2,626,883		9,486				14,301,251
	Value	Dollars	1,171,678	301,385		765				1,473,828
Sugar	Quantity	Kilos	1,366,448		19,826,805					21,193,253
	Value	Dollars	84,116		1,230,562					1,314,678
Copra	Quantity	Kilos	4,495,369	2,797,713	251,540	135,210	178,622			7,858,454
	Value	Dollars	374,237	243,490	10,520	10,378	14,523			653,148
Cigars	Quantity	Thousand	13,146							13,146
	Value	Dollars	193,026							193,026
Cigarettes	Quantity	Thousand	2,093							2,093
	Value	Dollars	2,017							2,017
Tobacco	Quantity	Kilos	816,833							816,833
	Value	Dollars	102,496							102,496

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

AUGUST, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperatute.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.4	------	27.3	------	27.5	------	28.6	1.8	26.8	------	26.3	------
2	26.2	0.5	26.4	------	26.6	------	28.4	28.2	27.1	18.3	27.6	------
3	26.1	98.6	26.2	1.0	26.7	0.3	28.0	1.8	27.6	2.3	27.6	------
4	26.2	31.2	27.4	7.1	26.9	------	28.8	------	27.8	------	29.2	------
5	27.3	------	27.7	------	26.6	------	28.6	------	29.0	------	28.8	49.5
6	28.3	------	28.0	1.3	25.8	------	29.2	------	28.7	------	28.2	2.3
7	28.6	------	28.3	13.7	27.0	------	29.2	17.7	28.2	------	28.3	4.0
8	27.4	2.3	27.4	------	27.5	.3	28.8	11.7	28.2	------	27.4	3.0
9	28.2	------	28.2	------	27.3	8.1	28.2	.5	27.3	7.4	26.9	25.7
10	27.8	------	28.3	------	27.3	10.4	28.0	.3	27.2	9.4	27.2	27.7
11	28.0	------	27.2	1.5	27.3	15.7	28.2	3.0	28.4	8.9	27.6	3.0
12	28.2	2.5	27.2	------	27.0	------	27.3	45.4	28.4	7.6	26.9	------
13	28.2	------	28.2	------	26.2	------	28.5	1.3	28.6	------	28.8	------
14	28.4	------	27.2	------	26.9	1.5	27.8	28.9	28.6	------	28.5	------
15	27.1	.3	27.5	.8	22.0	.5	28.2	------	28.7	.8	28.6	33.0
16	27.4	3.6	27.8	10.7	26.5	------	29.4	------	28.7	------	28.2	49.8
17	27.7	------	28.3	------	27.2	------	29.8	2.0	29.1	------	27.8	.5
18	28.7	------	28.3	------	27.8	.8	29.6	------	28.6	------	27.7	------
19	27.7	------	27.9	------	28.1	------	30.4	------	28.4	------	27.8	------
20	27.2	16.7	26.1	22.1	26.8	17.8	29.8	8.9	28.5	------	28.0	------
21	27.4	1.3	27.7	2.6	26.0	10.4	29.2	1.3	28.3	------	28.6	2.0
22	27.5	------	27.2	------	25.8	2.6	28.7	------	29.5	------	28.0	------
23	25.7	2.5	27.2	------	26.1	12.7	29.1	2.0	28.2	------	------	------
24	26.6	------	27.2	------	26.3	------	30.0	13.0	26.0	3.8	27.1	------
25	25.8	3.8	27.6	------	27.1	------	28.3	------	26.5	.5	27.7	------
26	27.0	------	27.9	------	27.2	.3	28.2	21.6	26.8	1.5	27.5	25.4
27	27.8	.5	28.0	------	27.1	5.8	27.6	20.6	24.9	39.1	26.6	61.4
28	27.5	1.4	27.8	------	27.1	------	28.8	8.4	24.7	15.0	25.5	26.2
29	28.3	.3	28.0	16.2	27.8	4.8	26.9	27.4	24.6	11.3	26.2	22.9
30	28.2	16.6	26.8	6.4	27.4	2.3	27.6	7.4	27.5	------	26.0	12.7
31	26.8	1.8	28.0	------	25.8	50.3	27.6	3.1	27.9	------	27.4	27.7

CURRENT PERIODICAL LITERATURE.

ARTICLES IN CURRENT PERIODICALS, ETC., THAT MAY BE OF INTEREST TO AGRICULTURISTS IN THE PHILIPPINES.

Rough Rice as a Food for Horses and Mules, by Dr. W. H. Dalrymple, Veterinarian, *The Louisiana Planter,* Volume XLV, No. 2 (July 9, 1910). Experiments conducted at the Louisiana Experiment Station with two mules, to determine the value of rough rice as a food, and proving that when it is ground, and forms one of the ingredients of a mixed ration, it may be fed with safety and benefit.

La Cultura du Riz au Cambodge. Baudoin, Administrateur des Services Civils, Resident de France á Kompong Cham. *Bulletin Economique,* No. 83 (Mars-Avril, 1910). History and methods of rice culture in Cambodge. (To be continued.)

Sugar in the West Indies and in Java. From *The London Produce Market Review.* Reprinted in *The Louisiana Planter,* Volume XIV, No. 6 (Aug. 6, 1910). A brief comparison of the sugar industry in Java with that in the West Indies, and a rather full account of the progressive methods employed by Javanese planters.

Copra and Vegetable Butter. *The West Indian Committee Circular,* Volume XXV, No. 308 (July 19, 1910). A practical method for converting crude copra oil into a palatable and satisfactory vegetable butter, and the prospects for the future of the industry. Brief.

Rubber in Dominica, by E. A. Agar. *The West Indian Committee Circular,* Volume XXV, No. 308 (July 19, 1910). A brief résumé of the rubber industry in Dominica, discussing the merits and needs of the various kinds of trees planted.

Rubber and Coffee in the Orient and Mexico, by Pehr Olsson-Seffer. *The American Review of Tropical Agriculture,* Volume I, Nos. 3–4 (Mar.-Apr., 1910). A continued series of articles, discussing rubber in Hawaii, Java, Malaya, Ceylon, and Mexico, also coffee in Java, Mexico, etc.

The Castor Oil Plant, by Runar I. Olsson-Seffer. *The American Review of Tropical Agriculture,* Volume I, Nos. 3–4 (Mar.-

Apr., 1910). An account of the castor oil plant, giving a description, methods of cultivation and extraction of the oil, and its uses.

Pod-Rot, Canker, and Chupon-Wilt of Cacao caused by *Phytopthora* Sp., by James Birch Rorer. *The Bulletin of the Department of Agriculture, Trinidad,* Volume IX, No. 65 (July, 1910). A discussion of the three most destructive diseases attacking cacao trees in Trinidad, giving their history, description, and preventive and remedial measures that have been found of value.

Bleaching of Ginger, by G. B. Patwardhan. *The Agricultural Journal of India,* Volume V, No. 3 (July, 1910). The process employed in bleaching ginger in Southern India. The directions given are very clear and explicit.

Citrus Fruit Culture in Cuba, by I. A. Wright. *Tropical Life,* Volume VI, No. 7 (July, 1910). A continued series of articles, dealing with the citrus industry as a whole, its problems and possibilities.

La Question du Soja, by H. Brenier, Inspecteur-Counseil p. i. des Services Agricoles et Commerciaux de l'Indo-Chine. *Bulletin Economique,* No. 83 (Mar.-Avr., 1910). Varieties, culture and commercial importance of the soy bean.

PLATE I.—PREPARING A FIELD FOR TRANSPLANTING RICE.

THE PHILIPPINE
Agricultural Review

VOL. III NOVEMBER, 1910 No. 11

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EDITORIAL.

THE PHILIPPINE RICE CROP.

The degree of prosperity of the farmers throughout the Philippine Islands is probably influenced more by the condition of the rice crop than any other one thing. Rice is the great staple food crop of the Islands, and an abundant harvest means comfort and prosperity to a large part of the Filipino people. On the other hand, the failure of the rice crop because of drouth or other causes brings hardship and even suffering to the people

in the sections where such failure occurs. In many municipalities, in fact throughout entire provinces, rice is the one important crop cultivated. When this crop fails the farmers are left with few or no other resources. In sections where abacá, copra and sugar are the staple crops grown, we find rice the principal article of food. The money obtained for these products is used, therefore, to a considerable extent at least, for the purchase of rice, so that a poor rice crop affects even the sections of the country where rice is not cultivated.

In considering any improvement of conditions pertaining to rice growing in the Philippines, three factors should receive particular attention: First, the area of rice cultivated is largely dependent on the number of work animals available for preparing the land; second, complete failure of the rice crop in any locality is usually due to the lack of an adequate supply of water available when it is needed; third, the degree of success obtained by the rice grower depends in a considerable measure on the variety of rice grown and the manner in which it is cultivated. It is obvious, therefore, that an abundant supply of work animals and water, together with the use of seed of the best varieties, and improved methods of cultivation are essential to the production of the best possible rice crops.

The results that have followed the destruction of carabaos and cattle throughout the Islands by rinderpest, and the efforts that are now being made to completely eradicate this disease, are too well known to require comment. The large areas of uncultivated land that were once rice paddies bear silent testimony to the work of rinderpest. There is no lack of an abundance of suitable land in the Philippines, not only for growing all the rice required for local consumption, but also for producing rice in sufficient quantity for export. With the elimination of rinderpest there is no reason why there should not be, within a few years, sufficient animals to bring a large part of this land under cultivation.

An abundant supply of water throughout the growing season is essential to the production of a good crop of lowland rice. At the present time large areas, having no facilities for irrigation, are planted to lowland rice. The crop, therefore, is entirely dependent on the weather conditions and frequently the conditions are such that the crop is a failure. The necessity for more extensive facilities for irrigation are now fully appreciated, and every effort is being made by the Insular Government to develop such facilities in different parts of the country.

It has been estimated that there are at least 200 distinct

varieties and sub-varieties of rice in the Philippine Islands. There is great variation in these varieties and some are much more valuable than others. At present the rice growers make little or no effort to select the seed of the best varieties, or even to select good seed of any one variety. Field experiments are now being carried on by the Bureau of Agriculture with a large number of varieties of both upland and lowland rice for the purpose of determining which varieties are best suited to conditions found in different parts of the Islands.

Any general or widespread improvements in the methods of rice cultivation in the Philippine Islands will, of necessity, be brought about gradually. The use of improved implements, the better preparation of the land, and the better care of the growing crop will only come as the farmers begin to see and appreciate the results obtained by improved methods.

In the present number of the REVIEW we are publishing an article on "Rice Growing in the Philippine Islands" prepared by a Filipino employee of the Bureau of Agriculture, who has devoted a large amount of time to the investigation of this subject and who is now in charge of field experiments with upland rice that are being made at the Lamao Experiment Station.

PROVINCIAL EXPOSITIONS.

Arrangements are now being made in several provinces to hold provincial fairs or expositions at some time during the next three months. It is understood that one reason for holding these fairs is that they are to be a means of preparing for the Insular Exposition to be held in Manila during the next Carnival. Material for exhibits will be collected, used at the local fairs, and then forwarded to Manila as provincial exhibits for the Insular Exposition.

We believe that no better means could be devised for obtaining satisfactory provincial exhibits than that of holding these provincial fairs. Many persons, who might hesitate to furnish material for an exhibit that was to be used only in Manila, would gladly contribute such material for a fair that was to be held in their own province. Furthermore, the local fairs will give an opportunity for the classification and preparation of exhibits before they are sent to Manila.

Although the provincial fairs will serve a useful purpose as a means of preparing for the larger Insular Exposition, this feature will be of secondary importance as compared with their

educational value as local expositions. There is no good reason why many, if not all of the larger provinces, should not hold a successful annual fair. Such fairs will be attended by thousands of people who could not come to Manila, and should serve as a strong stimulus to greater activity along different lines of industrial work. Inasmuch as the provinces have contributed largely year after year to the success of the Insular Carnivals and Expositions, it is believed that such interests as are centered in Manila should show an equal willingness to assist the provinces in making their local expositions the success that they deserve to be.

RICE GROWING IN THE PHILIPPINES.

By Silverio Apostol,
Agricultural Assistant.

INTRODUCTION.

There is no other plant as widely known or of such vital importance to the inhabitants of the Philippines as rice. Rice (*Oryza sativa*) is an annual plant belonging to the great family of grasses, botanically known as *Gramineae*. This plant is believed to be indigenous to Asia, and also to Australia. Rice is now more or less extensively cultivated in nearly all tropical and semi-tropical countries, and constitutes the staple food of about one-half of the human race. Whether it is an indigenous or an imported plant in the Philippines is an unsettled question; but whatever may have been its origin, Magellan, in 1521, found it practically the only crop then cultivated in the Islands. In fact, at one time, rice was the only article of export from the Philippine Islands, but with the subsequent increase in the production of more profitable crops such as abacá (Manila hemp), sugar cane, coconuts and tobacco, the cultivation of rice diminished. Consequently, as the population of the country and the food required of the inhabitants increased, rice, instead of being an article of export, has become one of the leading imports.

DISTRIBUTION.

Rice is cultivated throughout the Philippines. In this country it occupies an even more important position as an article of food than that of wheat in Europe and North America.

In view of the importance of this cereal, it becomes at once obvious that its culture should receive the most careful attention, not only from the Bureau of Agriculture but also from every individual farmer and grower. Especially is this necessary and important when we consider that more than 200,000 tons of this staple food product of the country are imported annually. This amount, at first glance, may seem insignificant, but it means a drain of from ₱8,000,000 to ₱16,000,000 from the Islands every

year, which sum might well be saved and utilized for some of the many needs of the country. The Bureau of Agriculture is now experimenting with and studying the many varieties of this crop in the Philippines with a view of improving the quality of rice grown, and of increasing the total production.

VARIETIES.

The total number of different varieties of rice in this country is undetermined. This subject is now being investigated, and is one of the objects of our experiments. Some authors state that there are about 150 varieties, others double or even triple this number. While it is not as yet possible to make a definite statement, as our experiments are still in progress, it is probable that there are in these Islands not less than 200 distinct varieties and subvarieties of rice. These varieties may be grouped in three ways:

I. According to the habit of the plants, i. e., the natural conditions under which they seem to grow and produce best. Under this method of grouping we have (1) the lowland or irrigated, and (2) the highland or nonirrigated varieties. Although there is no sharp dividing line between these two groups, the difference is very marked when we compare the extremes, but grows less and less pronounced as we approach varieties that can be grown under either of the above-mentioned conditions.

II. According to the texture or composition of the kernels, the grain may be (1) glutinous or (2) nonglutinous.

III. Rice, like wheat, may be (1) awned (bearded) or (2) awnless (beardless).

In other words, some varieties of rice are decidedly highland or upland in their habits, needing comparatively little water for their development—in fact, standing water on the field is often detrimental, and even fatal, to these upland varieties of rice—and they thrive well without transplanting; while others require flat lowland with plenty of water, and have to be transplanted in order to obtain the best results. Moreover, these different varieties may be either glutinous or nonglutinous, and bearded or beardless. The different varieties are further characterized by their special flavor, taste, and aroma; shape and size of the grain; density and texture of the kernel; cooking quality; color or markings of both the cuticle and the hull; characteristics and behavior of the plant; length of growing period; and by many other points of difference.

The nonglutinous varieties of rice are the ones principally grown in the Islands for ordinary food purposes. The glutinous

varieties are grown only for special purposes, such as making puddings and other culinary preparations.

Many varieties of rice are adaptable to a considerable range of climatic and soil conditions, as may be observed from their geographical distribution.

GROWING PERIOD.

The length of the growing period varies widely with the different varieties—about eighty-five to ninety days is the shortest, and seven months the longest. Occasionally farmers claim to have seen or known of certain varieties of rice that have been harvested in two and one-half months from the time the seed was put into the ground, but the accuracy of these statements may be questioned. The highland or nonirrigated varieties are generally early bearers.

SOIL.

Rice can be grown on almost any kind of land, but a medium loam with about 50 per cent of clay is the best. In general, a soil that will produce good corn, sugar cane, or cotton will also produce good rice. It does not follow, however, that good rice land will always produce the above-mentioned crops as well, as generally good rice land has an impermeable subsoil, and this condition is detrimental to cotton, cane, or corn, due to the accumulation of too much water during the rainy season. Sandy soils do not have the power of mechanically holding water which a clayey or loamy soil possesses, and thus are not so well suited to rice growing. The water percolates more freely through a sandy soil, and this fact should be kept in mind when we consider the subject of irrigation.

LOCATION.

The land used for growing rice, especially for lowland or irrigated rice should be level to avoid the heavy work and expense of leveling and building dikes. It is not only more economical to grow rice on level land, but this condition, other things being equal, is also necessary to give the crop uniformity of stand and, ultimately, a uniform ripening. The presence or absence of water and the depth of water in the field exercises a great influence upon the rate of ripening the rice crop. At the time of harvest it is not unusual to observe green patches here and there in a field where but one variety of rice is grown, due to the accummulation of water, when all the rest of the field, where the land is comparatively dry, is ripe enough to be cut. When this happens, one of two things has to be done;

either cut the green patches prematurely with the rest, or let them stand longer and ripen. If the former is done, we get chaffy, imperfect grains which are crushed into powder and mixed with the bran in the mill; if the latter is practiced, these patches are likely to be destroyed by stray animals before the grain is sufficiently ripe to be cut; besides, there is extra work and attention required in caring for and harvesting these small patches which have been cut with the rest of the crop.

The necessary number and size of dikes in a field are determined by the lay of the land. The greater the slope the higher and closer the dikes have to be built, and the smaller the fields. There is a limit to the slope beyond which the putting of dikes becomes impracticable. In this case, terracing is the only practicable thing to do to make the land fit for irrigation or the growing of irrigated or lowland rice. Terracing is a common practice among the Igorotes of the Mountain Province.

Large fields are preferable to small ones, not only because of the expense incurred in the construction of more dikes in the latter, but also on account of the space lost where the dikes stand. Too many dikes offer a very great obstacle and inconvenience to proper and economical field work; especially is this true where modern methods of farming are followed, or where modern farm implements are used. In such cases much time is wasted in turning on small fields. For instance, in plowing: Let us take two fields of the same area, say "A" and "B", containing one hectare each. Field "A" is divided into two plots 100 by 50 meters each, and field "B" into four plots, 50 by 50 meters each. If a man with a carabao and a plough that cuts a furrow 20 centimeters wide would plow field "A" running lengthwise of the field, he would make 498 turns in the two plots. If the same man with the same outfit would plow field "B" he would make 996 turns in the four plots, or twice as many turns as would be required in field "A." Supposing that it takes a man an average of one-half minute to make each turn, then it would take him four hours and nine minutes or about one-half a day longer to plow field "B" than field "A", this difference being wholly due to the field being divided into smaller plots. Furthermore, the many dikes make excellent nurseries for weeds, and the cost of keeping them up is considerable.

FERTILIZERS.

The rice plant does not require a very rich soil for its proper development. When rice is grown on very rich land there is a tendency for the plant to develop luxuriantly, but with a light

head. The plant stools abundantly but many of the stalks do not bear at all. In many cases soil conditions in the rice fields might be improved by planting mungo, velvet beans, or some other leguminous plant as an after crop. The leguminous plants, with the aid of certain kinds of bacteria, are able to collect free nitrogen from the air. When the roots, leaves and stems of these plants decay, this nitrogen becomes available as plant food.

IRRIGATION.

The question of supplying water to rice fields is a great problem. That an adequate irrigation system is very essential in the cultivation of lowland rice can not be overemphasized. The amount of water necessary to produce a good crop depends especially upon the physical character of the soil, and the variety of rice grown. Each grower must solve his own irrigation problem. He has to study the character of his land, and be well acquainted with the requirements of the varieties of rice which he grows. Some varieties are hardier than others; they require comparatively little water during their period of growth, and are more able to endure drought, while certain others can only be made to stool and bear well with a liberal supply of water. For irrigation, the water from lakes and large rivers or canals with a slow current is better than that which comes from rivers having a swift current. The former is warmer and generally carries more or less fertilizing material, but still better is the water from adjoining fields. For the strictly lowland varieties, there is no harm in having water on the field during the plant's entire period of development, but where the water is under control it would be better to cut off the water supply every now and then and let the surface water drain off so as to expose the base of the plants to the action of the sun and allow the soil to warm up and aerate. Care should be taken, however, not to continue this state too long so that the soil will become air dry by evaporation, or the plants will suffer seriously.

SEED SELECTION.

But little attention is given to the question of seed selection by most of the rice growers in this country. The results obtained in rice growing depend largely upon judicious and careful selection, and the method of separating and storing the seed. Farmers should obtain the best variety of seed suited to the conditions existing on their farms. One of the first requisites in seed selection is that the fields be visited often enough so that the differences in vigor, stand, diseases, etc., of different plants

and different varieties may be noted. Some farmers do not visit their growing crop at all until they think it is about time to harvest. "All of the work in this business," they say, "is in the planting and harvesting. After you have transplanted your rice, you can leave your fields and need not return until time to harvest the crop."

Seed should be selected at harvest time, and while the plants are standing in the field. In selecting plants for seed, the farmer should be guided not only by the actual crop conditions but also by his previous observations. The best seed should be saved for the next crop, inestead of simply taking at random the required amount of grain needed for the next season's seed after the entire crop has been thrashed and cleaned. It is very much easier to eliminate poor seed before than after thrashing. The plants that are to furnish seed should be cut, cured, and thrashed separately from the rest of the crop. Care should be taken that the seed is perfectly free from foreign seeds before thrashing. Beside affecting the stand of the crop, foreign seeds interfere with milling the grain and lower the market value of the crop; especially is this true when red kernels are mixed with white rice. The seed should be carefully stored, precautions being taken to keep it dry and free from attacks of vermin or insects.

SEED TESTING.

Humidity weakens and may even destroy the vitality of seed rice. The seed should be tested to determine its vitality before planting. Especially is this necessary with upland rice, which is planted direct in the fields instead of in seed beds. Under ordinary conditions it takes from five to seven days to determine whether we have good or poor seed.

In testing seed the following precautions should be observed:

(1) Make the test early enough to allow ample time to obtain good seed in case the seed tested is found to be poor.

(2) More accurate results will be obtained by testing the seed in shallow boxes filled with light soil than in the ground. Provide the boxes with some sort of cover (this can easily be made from bamboo slats) to protect the grain from fowls and vermin.

(3) Much of the accuracy of the test depends on the proper selection of samples. Mix the seed thoroughly so as to secure a representative sample. After the sample has been perfectly cleaned, take a *known* number (at least 1,000 grains), the larger the number of grains used the more satisfactory will be the test.

(4) Moisten the soil in the box and then level it, taking care that it is left loose and spongy. Sow the seeds and then cover them with a layer of dry soil thick enough to bury the grains. Sprinkle a little water on the soil and put the box where the sun can reach it sometime during the day. Keep it moist all of the time but not very wet. Count the sprouted grains every morning as you pull them out. Continue until no further germination is observed. When the total number germinated is found, the proportion of bad and good seed can be calculated.

Other conditions being equal, awnless rice is preferable to the awned, because it is easier to handle. Especially is this true with the present methods of harvesting, thrashing and milling rice in this country. In fact, it is not the practice of the Filipino farmers to thrash bearded rice, principally because the awns make the feet of the animals bleed when they tread it out, but with modern machinery the awns are no obstacle either in thrashing or hulling. On the other hand, the awn, to some extent, prevents damage by birds. Generally the grains of the bearded varieties are fastened more firmly to the stem than those of the beardless varieties.

PREPARATION OF THE SOIL.

Very little attention is paid by our farmers to the matter of preparing the soil for rice planting. Rice is a tender-rooted, shallow-feeding plant. Bearing this in mind, it is obvious that the ground should be worked up well before planting so as to allow the free growth and proper development of the roots—the feeding organs of the plant. Where the soil is in hard unbroken lumps the plants can not obtain a sufficient amount of food. In the case of upland rice thorough preparation of the land not only kills the greater portion of the weeds by tearing them up and exposing them to the action of the sun, but it also greatly diminishes the loss of water by evaporation. Hence, by proper preparation of the soil, the rice crop can in a great measure, be given a good even stand right from the start. The plowing does not have to be very deep; ordinarily from 10 to 15 centimeters will be sufficient, especially for virgin lands; but for old rice land where there is a rich compact subsoil, deeper plowing should be practiced every third or fourth year so as to bring to the surface some of the virgin soil with its fertilizing ingredients for the crop. For irrigated or lowland rice, have the field well stirred up and brought to a mellow, sloppy consistency at the time of transplanting.

LOCAL METHODS.

Although the general methods of growing rice are similar in different parts of the country, there is more or less difference in the details of the work in different sections.

There are two very common ways of growing upland or non-irrigated rice, *caiñgin* and *sabog:*

Caiñgin.—People who own no carabaos, and who have very limited means, plant rice on the woodlands and low hills by trading work with their neighbors. This is a very common practice throughout the Islands. The preparation of the land consists merely in clearing away brush and small trees by means of bolos and fire before the rainy season sets in, leaving the stumps in the ground. The seed is then planted at the beginning of the rainy season in Luzon, generally during the latter half of May and the early part of June. No further cultivation is given.

The planting is a very interesting operation and affords a pleasant occupation to those who are engaged in the work. The planters (usually men), who are equipped with wooden sticks having a sharpened end about 3 or 4 centimeters in diameter, place themselves side by side about one meter apart. The stick is sometimes made of bamboo and pointed with a piece of iron. Following comes a line of women and children with the seed. The seed is held in sections of *bojo* or small bamboo, about fifty centimeters long, which are closed at one end. The planters in front move backward in more or less parallel lines as they make holes in the ground with their sticks, and the seeders, closely following, place from 5 to 20 grains in each hole. The holes are usually from 10 to 20 centimeters apart. The seed is placed with the right hand and covered with the left by filling the hole with earth with the butt of the bamboo tube or seed holder. In other places the seed is held in a coconut shell, instead of in a bamboo tube. In this case the grain is covered by a third row of people who come behind the second and brush the loose surface dirt into the holes.

According to Mr. E. Y. Miller (Smithsonian Miscellaneous Collections, Vol. 47, March 2, 1905) the Cuyonese use an instrument known to them as "tugda" in place of the pointed sticks or poles used by the people of Luzon and the Visayas. The "tugda" consists of a stem and drill-point of tough bamboo. The stem is about 5 meters long, and the length of the point piece is about 53 centimeters. It is bent at its lower portion, just a little above where the point piece is attached. This curvate gives the "tugda" a kind of spring whereby the instru-

ment is made to rebound every time it is thrown into the ground.

It is customary to plant 10 or 20 grains of rice in each hole, which is entirely too many. In most cases, with good seed, and under proper weather conditions, from four to seven grains in holes at a distance of about fifteen centimeters apart will be sufficient. This is the *caiñgin* method of planting upland rice.

Sábog.—Some farmers have one or two carabaos but no land to cultivate. These people, however, can often find arable places on the public lands. The ground is plowed once in the dry season in preparation for the rice crop. At the beginning of the rainy season, the land is fenced with bamboo, plowed once more, harrowed, and the seed is sown broadcast. Some prepare their fields fairly well with the aid of a roller and a harrow, but such cases are exceptions rather than the rule. The thickness of sowing depends entirely upon each farmer. After sowing, the field is harrowed lightly to cover the seed. This completes the planting, and generally no further work, such as weeding or irrigating, is done until the crop is harvested. This method of growing rice is locally known as *sábog,* and under ordinary conditions gives a return of from 5 to 10 cavanes (1 cavan equals 75 liters) from one of seed.

Some Visayan farmers do not sow the seed, but when the ground is ready the seed is planted in shallow drills. The man with the seed follows behind the plow and drops from 5 to 20 grains at intervals of from 10 to 20 centimeters, covering the seed with earth from the edges of the furrow with his foot. This method is called *pangas.* A modification of this method is practiced by some Visayan farmers. The seed is thinly sown in the furrows instead of dropping it in hills; it is then harrowed lightly to cover the seed. This is also known as *pangas.*

The practice of early plowing is in many respects advantageous, especially with heavy soils. Beside affording ease of operation at planting time, it allows the soil to aërate. This practice also kills weeds by covering the plants with earth before they mature seed, thus adding organic matter to the soil.

LOWLAND OR IRRIGATED RICE.

In the cultivation of lowland or irrigated rice, there are several steps, but practically one method.

In certain localities *sábog* and other similar methods, which vary only in minor details, are employed to some extent in growing lowland or irrigated rice. In this case, however, the seed is sown in a wet or sloppy bed, and the sowing is thinner than

in the case of upland culture. But the most popular and profitable practice throughout the Archipelago is by transplanting the seedlings, and the first step in this work is the preparing of the seed bed.

SEED BEDS.

In the absence of artificial irrigation, the work is begun with the advent of the rainy season. During May (in certain localities as early as the latter part of April) and the first half of June the seed beds are prepared, and from the latter part of June to the middle of September the transplanting is done. The ground for the seed bed is plowed and harrowed three or four times until the soil is pulverized enough for good germination. The bed is then divided into plots by running a plow deeply at intervals of about two meters, after which the seed is sown broadcast rather thickly and covered thinly with the soil from the edges of the plots. At some places dividing the bed into plots is not practiced, in which case the seed is covered by running a light harrow over it after sowing is done.

The Ilocanos usually drill the seed instead of sowing it. Three men are generally used to do this work. One man is provided with a large wooden fork-like instrument with which he makes the holes, and two others follow to distribute the seed, leaving from 15 to 40 grains in each hole. The holes made in the soil are about 7 or 8 centimeters apart, 3 or 4 centimeters deep, and 3 to 3.5 centimeters in diameter.

SEED SPROUTING.

Some farmers sprout the seed before sowing it in the seed beds. The seed is put in a sack and then placed in water to soak. After a period of from twelve to twenty-four hours, the seed is removed from the water and put aside for about twenty-four hours, or until at least fifty per cent of the grains have sprouted, when it is sown broadcast. The bed at the time of sowing must be well worked up, well saturated with water, and kept in this condition until the seedlings have acquired sufficient height and vigor to survive under the ordinary weather conditions of the season. This practice is based on the belief that the plants grow faster because they are started with sprouted seeds. While this may be true under the most favorable conditions, such is not ordinarily the case. On the contrary, the practice has a number of objectionable features. A good seed under favorable soil and weather conditions will germinate as soon if not sooner when it has not been sprouted. Sprouted

seeds require a more or less sloppy bed at sowing time, and this practice should not be attempted unless the water supply is abundant. If the bed is not sufficiently wet the sprouted seeds will suffer much from the action of the sunshine before they can establish their rootlets in the ground, and if the seed is not sown promptly the roots become tangled and render sowing difficult. Moreover, much of the seed dies from the injury to the roots, caused by handling. Seed sprouting is also practiced without transplanting. But this method is still worse than with transplanting, and should never be attempted unless there is an adequate supply of water.

Another method known as *palusót* is used in some localities. By this method the field is flooded and the ground stirred up well, and then the sprouted seed is sown broadcast in water, sometimes 10 centimeters deep. The grain settles on the muddy bottom, and the foliage finds its way through the water to the sunshine. Hence the name *palusót* meaning to grow or pass through. The main objection to this practice is the difficulty or impossibility of sowing the seed evenly. There is no practical benefit gained by this method. On the contrary, if the water is too deep the plants die before their leaves reach the surface.

Transplanting.—The seedlings should be transplanted when they are from four to seven weeks old. If earlier, the plants are generally too tender to endure transplanting, especially if the seed bed is of heavy soil. The seedlings, should be transplanted before they form nodes, because after this stage they develop only comparatively few roots. It is not advisable to pull the seedlings until the time of transplanting, preferably the day before. The young plants are pulled up and tied with bamboo slatch in small bundles about 6 or 7 centimeters in diameter. These are then taken to a pond, the adhering earth washed from the roots, and the bundles scattered over the fields. If the seedlings have grown very high, they should be trimmed to about 23 centimeters long before being transplanted.

One good plowing about five days or a week before planting is sufficient in most cases, but where the land is weedy and heavy it should be plowed twice and harrowed. At the time of planting, when the surface water is 10 to 15 centimeters deep, the *suyod,* a native comb-like implement, drawn by a carabao is used to level the ground and work it into a sloopy consistency. The teeth of the *suyod* are about 25 centimeters in length and 13 to 15 centimeters apart.

The work of transplanting is generally done by women, boys and girls, who stand side by side about 50 centimeters apart in a line and move backward. The seedlings are held in the left hand, and with the right they tear off from one to six plants and, with the aid of the thumb and the first two fingers, stick them into the muddy bed about 15 to 25 centimeters apart.

The Ilocanos use a sharp-pointed wooden stick, 15 to 20 centimeters in length; the stick is held in the left hand with the bundle of seedlings, and used to make holes in the ground, while with the right hand they place from 1 to 6 of the seedlings in each hole. With this method they use less water on the land.

In determining the number of seedlings which should be planted on a given area, we should be guided by four factors, namely, (1) the fertility and preparation of the soil, including the water supply, (2) the variety of seed, with special reference to the size and ability of the plants to stool; (3) the condition and age of the seedlings; and (4) the time of transplanting, whether early or late in the season, especially where there is no artificial irrigation.

HARVESTING.

Generally no work or care is given the rice plantation after the transplanting is finished. Some farmers do not visit their fields even once between planting and harvest time, and they only blame their "luck" when they gather a poor crop, when in most cases if the plantation has suffered and the crop is poor, it is largely due to their negligence.

There are two ways of harvesting rice in the Philippines, and these depend on whether the crop is bearded or beardless. For the bearded varieties a hand instrument, having a wooden handle about 15 centimeters long and 2.5 centimeters in diameter, with a small iron or steel blade, is used. The blade is thin, 2.5 to 3 centimeters wide, about 10 centimeters in length, sharpened on one edge, and fastened crosswise in a cut made at a point about 6 centimeters from the large end of the handle. The instrument is held in the right hand, with the blade between the first two fingers. To do the cutting, the fingers are extended and one or more straws are gathered in and drawn against the cutting edge by closing the fingers.

Awned or bearded rice is not usually thrashed, and when harvested about 25 centimeters of straw, are left with the heads and all adhering leaves are removed; the rice is tied up near the heads with bamboo slatch into small bundles about

PLATE II.—TREADING OUT RICE WITH CARABAOS.

7 centimeters in diameter. Six of these bundles are called *manojitos, quinis,* or *bulsác,* and, grouped in larger bundles, are known as *manojos* or *pungos.* When sufficiently cured they are sold, stored up in granaries, or sent to the mill for hulling. The amount of the harvest is customarily expressed in terms of so many *manojos,* or a larger unit *oyónes;* one *oyón* being equal to 20 *manojos* or *pungos.*

Bearded rice is almost the only kind cultivated by the people in Northern Luzon, beginning with the northern parts of the provinces of Tarlac and Nueva Ecija, and especially by the Ilocano growers. It is undoudtedly due to this fact that the awned varieties are commonly called *palay Iloco* or Ilocano rice in the Tagalog provinces. Harvesting is usually done on shares at the rate of from $\frac{1}{8}$ to $\frac{1}{4}$ for the worker or harvester.

In the Visayas bearded rice is as rare as the beardless varieties are among the Ilocano growers. Awnless rice is cut with a kind of sickle having a wooden V-like handle, and a blade about 20 centimeters long and 3 centimeters in width. The blade is slightly curved toward the cutting edge, and fixed at an angle in the handle about 15 centimeters from the end, just above the grip. With the sickle held in the right hand, 20 to 50 stalks are caught by the hook-like handle, and with a little twist the straws or stalks are drawn together and grasped with the left hand, the instrument is disengaged, and the stalks are cut about 30 centimeters below the heads. This operation is continued until there is enough cut to make a bundle about 15 centimeters in diameter, when it is tied up, with a few long straws. If the field is dry the bundles are left to cure until late in the afternoon; but where there is surface water, they are piled up on dikes and in the evening they are hauled to a place where they can be cured. After curing and while the harvest is in progress, they are shocked to prevent the grain from being spoiled by the excessive sunshine and occasional showers. The harvesting of awnless rice is also done on shares in certain localities, but generally the harvesters are paid so much a day with subsistence (breakfast and dinner).

THRASHING.

There are several ways of thrashing rice practiced in the different parts of the country. In some places the straw end of the bundle is fastened between two wooden sticks about 45 to 50 centimeters long, which are tied together by a piece of rope about 8 centimeters from one end, and the heads are then beaten against a hard board. In other places flailing is prac-

ticed. But the most common method is that of treading out the grain by either animals or men. In Iloilo Province this is done by men on a bamboo platform about 2 or 2.5 meters high, so that the chaff is carried off by the wind as the grains fall to the cleaned hard ground below. Where the thrashing is done by animals the chaff is blown off by pouring the grain from a platform while the wind is blowing. Only a few modern thrashing machines are used on Philippine farms. The paddy is either stored in granaries or shipped to Manila or other places for hulling. There are now many modern mills of various sizes in operation in the provinces, both in Luzon and the Visayan Islands.

As to the cost of production, it is very difficult, if not impossible, to give a definite figure as the labor conditions vary widely in different localities. It is estimated at from ₱15 to ₱25 per hectare for lowland or irrigated rice.

PLATE III.—TREADING OUT RICE (METHOD USED IN THE VISAYAN ISLANDS).

[Agricultural Extension Work Lecture No. 2.]

THE VEGETABLE GARDEN.[1]

Compiled by H. T. Edwards,
Assistant to the Director of Agriculture.

Every farmer should have a good vegetable garden. The object of this lecture is to state some of the reasons why you should have a vegetable garden, and some of the things that you must do if you are to have a good garden.

Every person should have a plentiful supply of different kinds of good food. You will note that I say *different kinds* of good food. It is not enough that you have a plentiful supply of good food, but you should also have different kinds of food. Rice is a good food, but the person who eats nothing but rice for a long time will get sick. Fish is a good food, but no person wants to eat only fish. We all want and need different kinds of food, so we eat rice, fish, meat, green vegetables, and other materials.

The most important reason why you should have a good vegetable garden is, that it will furnish you a large supply of different kinds of good food. When you have had a good garden for one year, with plenty of beans, eggplant, okra, tomatoes, squashes, peppers, onions, and other vegetables, you will want to have a garden every year.

It is not difficult to have a good garden. Any person who has a small piece of good land, and is willing to do a little work can have a garden. If you do good work and take care of your garden you will have a good garden. If you do poor work and do not take care of your garden you will have a poor garden.

[1] Reports of Mr. Harold Cuzner, Mr. North H. Foreman, Mr. S. C. Kelleher, and Mr. O. B. Burrell have been used in the preparation of this lecture.

LOCATION.

The first thing to do in making a vegetable garden is to select the best place for it. This place should be as near the house as possible, so that you can watch the garden and protect it from thieves and stray animals. It is well to have the garden on sloping land, so that the water will drain off when there are heavy rains. If it is necessary to make it on land that is low and level, ditches should be dug so that the land will be drained during the rainy season. The location for the garden should be where there is a supply of water that can be used for watering the plants when there is no rain. As plants require sushine the garden should not be planted where there is heavy shade.

In selecting the place for a garden, one of the most important things to be considered is the soil. Do not make a garden on land that is so dry and sandy that the plants will not grow, or on land that is filled with rocks. The soil should be fertile, so that the plants will have food; it should be deep, so that the roots will have plenty of room in which to grow; and it should be loose, so that it can be easily and thoroughly cultivated.

TIME FOR PLANTING GARDENS.

The best time for planting most garden vegetables in the Philippine Islands is near the end of the rainy season. At this season of the year the soil is moist and can be worked easily. If seeds are planted at this time, the plants will get a good start and the vegetables will mature and can be gathered during the dry season. When a garden is planted after the beginning of the dry season, many of the plants will not get a good start and will be killed during the hot, dry weather. If a garden is planted at the beginning of the rainy season, many of the plants will be killed by the winds, and heavy rains.

PREPARING THE LAND.

When you have selected a place for the garden, the first work to be done is to prepare the land. If you are to have a good garden, the land must be well prepared before the seeds are planted. If there are large weeds and trash on the land that can not be turned under, they should be burned on the place where the garden is to be made, as the ashes will make good food for the plants. Any material that can not be turned under or burned should be carried away, so that the land will be entirely clean. If the garden is to be a large one the land may be plowed, but the best way to prepare land for a garden is to dig

it up thoroughly with a spade. Even where the land has been plowed, it is well to also dig it up deeper with a spade. If you can get any manure, it should be spread on the land and well mixed with the soil when the ground is plowed or dug up. Do not work the soil when it is very wet or it will form lumps or clods. When the work of plowing or spading is finished, the ground should be raked over and all of the large lumps broken up. After the ground has been thoroughly raked over, so that it is smooth and level, the beds where the seeds are to be planted should be levelled up a little higher than the rest of the land. Do not make the beds too high, or the soil will dry out rapidly.

FENCING.

In most places there are many hogs and goats that will destroy the garden unless it is protected by some kind of a fence. This fence should be made before the seeds are planted. Different kinds of fences are used in different places, and the kind of a fence that it is best to use will depend on the kind of material that can be had and the amount of money than can be spent. You can make a good fence out of bamobo that will be entirely satisfactory for at least one year. It is important that the fence be strong enough to keep out all hogs and goats, and one that will last through the season until after the vegetables have matured and have been harvested.

PLANTING THE GARDEN.

If you are to have a good garden, it is well to have a germinating bed. This is a place where the seeds of such plants as tomatoes, cabbage, eggplant, and lettuce can be planted and protected from ants and other insects. If these seeds are planted in the garden, a large part of them will be destroyed by insects. Large seeds, however, like squash and maize do not need to be planted in the germinating bed. After the plants have grown for a time in the germinating bed they should be transplanted to the garden.

The germinating bed can be made of bamboo, or other materials, and should rest on legs like a table. The legs should stand in little pans of water or petroleum so that ants can not reach the seeds. The bed should have a light shade over it to protect the young plants from the direct rays of the sun and from heavy rains. This shade can be made with a bamboo frame with banana leaves or cogon grass over the top. The covering should not be too thick, for some sunlight is necessary, and as the plants get larger the covering should gradually be removed.

The depth of soil in the germinating bed should be about 12 centimeters. A good soil for the bed can be made by taking one part of well-rotted manure, one part of good loam, and one part of fine sand. These three materials should be well mixed, and then placed in boxes on the bed. Before planting the seeds, the soil should be well firmed or pressed down with a board. Care must be taken that the soil is not too wet when it is firmed.

No rule can be given for the depth at which seeds should be planted, as this will vary with different kinds of seeds and with different kinds of soils. In sandy or dry soils the seeds should be planted deeper than in heavy or moist soils. The germinating bed should never be allowed to become dry, neither should it be watered so frequently or so heavily that the soil will be very wet, as this is liable to kill the young plants. With a little care and attention it is easy to get good results.

Transplanting should always be done either on a cloudy day or late in the afternoon, so that the seedlings will not be killed by the hot sun. Before the seedlings are removed from the germinating bed they should be well sprinkled; but do not wet the ground where you are going to plant them until after they have been planted.

In transplanting, great care should be taken not to injure the small rootlets. The young plants should be dug up, not pulled up, and they should be replanted as soon as possible so that the roots will not become dry or the plants wilted. In planting the seedlings first dig a hole deep enough for the plants. When the plant is placed in this hole see that none of the roots are twisted or doubled. The seedling should be planted deeper in the garden than it was in the germinating bed, and it may be set deep enough so that the earth comes up to the first leaves. The earth should be pressed down firmly around the plant, care being taken not to injure the stem. After the seedlings have been set out they should be watered, so as to settle the soil around the roots and supply the plant with moisture until it begins to develop more roots. After watering draw up some dry soil around the plant and over the wet spot. This will prevent a hard crust from forming on the surface of the ground. When large plants are transplanted it is best to pinch off some of the leaves.

CARE OF THE GARDEN.

In order to have a good garden you must take care of it. The beds should be kept free from weeds, and the soil should be kept loose so that the roots of the plants can grow well. Do not work the soil when it is very wet.

Young plants need water oftener than older ones do. If the weather is dry when the plants are young, the garden should be watered every two or three days. The best time to water a garden is in the evening. Such plants as radishes, lettuce, pechay, mustard, cabbage, and beets require frequent watering. Other plants, as turnips, tomatoes, peppers, beans, and onions, require less water after they have well begun their growth. Such plants as camotes, eggplant, peanuts, otong, and sincamas require but little water after their growth is started.

Most fruiting vegetables, such beans, peas, tomatoes, cucumbers, and squashes, will give better results if they have trellises on which to grow so as to keep the plant and the fruits off the ground.

Plants in the garden are sometimes killed by diseases, and are often attacked by different kinds of insects. The best way to keep plants free from disease is to keep them growing vigorously and to remove all dead weeds and other rubbish from the garden. There are many poisons that can be used to kill insects, but the use of poisons is dangerous and should not be attempted by persons who are not familiar with their use. If the garden is kept clean, and the plants are kept growing, there will be much less damage done by diseases and insects.

SEEDS.

A few of the best and strongest of each kind of plants in the garden should be allowed to mature their fruits in order to furnish seeds for the next crop. Do not save seed from sickly or weak plants. As far as possible, seeds should be obtained from your own garden or from people who have gardens in the municipality in which you live. If good seeds can not be had in the municipality where you live, they can be purchased in Manila and other places. The Bureau of Agriculture in Manila will send to any farmer in the Islands a collection of garden seeds free of charge, with instructions how to plant them. If you desire such seeds, write a letter to the Director of Agriculture, Manila, P. I.

GARDEN CROPS.

Do not try at first to grow too many different kinds of plants in your garden. A few kinds of good plants are better than many kinds of poor plants.

There are two general groups of plants that you can grow in your garden. These two groups are (1) the local plants, or those which grow in the municipality where you live or in other places in your province, (2) the foreign plants, or those of

which the seeds have been brought to the Philippine Islands from other countries. Some of the best local plants are mungo, sitao, cadios, pechay, condol, upo, patola, tugui, ube, gabe, and camotes. Some of the foreign plants that grow well in the Philippine Islands are maize, eggplant, okra, radishes, tomatoes, carrots, peppers, lettuce, mustard, and beets. There are many other good plants that you can grow, but these are some of the principal ones.

LOCAL PLANTS.

Mungo is a bushy plant 60 centimeters to 1 meter in height with small leaves and yellow flowers. It has many small pods 4 to 6 centimeters long, borne in clusters. Both the green pods and the ripe beans are used for food, and the beans are of excellent quality. Mungo should be planted near the end of the rainy season, as during the rainy season the heavy rains break off the blossoms and pods. It should be planted in drills 1 meter apart, and thinned to 15 centimeters in the row. Mungo will begin bearing in from five to seven weeks after planting, and will continue to bear for from six to eight weeks. This is a valuable crop, and one that is grown in many different parts of the Philippines.

Sitao is a plant having long slender vines with bunches of pink blossoms. It bears long narrow pods that are 15 to 20 centimeters long and about 1 centimeter wide. These pods are cooked while green, and are an excellent food. Sitao may be planted at any time in the year, and should be planted beside trellises about 1.5 meters apart. It will begin to bear in three months, and will continue bearing for six to eight weeks.

Cadios is a much-branched plant, 1.5 to 2 meters tall, bearing yellow flowers and small pods much like those of the mungo. The green pods and the ripe beans are eaten the same as the mungo. It should be planted early in the rainy season in rows 1 meter apart, and will bear in about six months.

Pechay is a plant with broad smooth leaves that are either cooked, or eaten fresh in salads. It will give the best results when grown during the dry season. It should be planted in drills 50 centimeters apart, and will be ready for use a few weeks after planting.

Condol is a plant much like the cucumber, with long vines and yellow blossoms. The fruits is shaped like a watermelon, and is 28 to 40 centimeters long and 12 to 15 centimeters in diameter. The half-grown fruits are eaten boiled with meat. The mature fruits are used for preserves or pickles. Condol should be planted during the latter part of the rainy season in hills 2 meters

apart each way. The plant will begin bearing in from three to four months and will continue bearing for several months. The mature fruits, if stored in a dry place, will keep in good condition for five or six months.

Upo has a long, climbing vine. It can be planted at any time of the year, and should be planted near a trellis or an arbor on which the vines can run. The fruit is light green in color and has a white, watery meat. One variety bears gourd-shaped fruits 40 to 80 centimeters long and 16 to 25 centimeters in diameter. Another variety has large, round fruits. The quality of the fruit of the upo is not very good, but this plant is widely grown in different parts of the Islands.

Patola is a plant with a long, climbing vine, coarse leaves and yellow flowers. It bears gourd-shaped fruits 25 to 50 centimeters long and 8 to 12 centimeters in diameter. The fruit is eaten as a vegetable, or is boiled with meat. Patola should be planted beside a trellis or arbor on which the vines can run.

Tugui grows long, slender climbing vines, and has a fleshy edible root. The tubers are borne in clusters around the main stem, and are cylindrical in shape, 6 to 12 centimeters long and 2.5 to 4 centimeters in diameter. The flesh is white, fine grained, and smooth to the taste. The tubers are boiled in water and are eaten with or without sugar. Tugui may be planted at any time, but will thrive best during the rainy season. Poles at least 2 meters in height should be placed for each plant to climb on. The plants die when the tubers ripen.

Ube.—There are several varieties of ube, all of which have long, coarse climbing vines with large leaves. This plant produces large, fleshy tubers which grow in a solid mass, all connected at the same stem end. These tubers are fine grained, smooth to the taste, and have a distinctive flavor. Ube is used as a food principally by the mountain people. It may be planted at any time.

Gabe is an herb with very large, broad leaves. The fleshy roots, leaves, and young shoots are used for food. Several different varieties are grown in the Philippines. The flesh of the tubers is fine, and smooth to the taste; different varieties have different flavors. Gabe grows best during the rainy season, and on low, loose, moist soil. It is propagated by planting the tubers.

Camotes.—There are many different varieties of camotes, some of which are of much better quality than others. The plant is a trailing vine which produces edible roots, that vary in size, shape, and color. The roots can be either boiled or fried. Ca-

motes thrive best when planted at the beginning of the rainy season, and are ready to harvest in six to eight months. They are usually propagated by cutting the green vines into pieces about 15 to 20 centimeters long and planting these pieces with about half their length in the ground.

FOREIGN PLANTS.

Maize is grown in many parts of the Philippine Islands as a field crop, but it is also an excellent garden crop. The best time for planting maize is near the end of the rainy season. It may be planted in hills 1 meter apart each way, with two or three plants in each hill. Maize will mature in fifty-five to ninety days depending on the variety, the soil and climatic conditions. It can be used in many different ways. When it is milk-ripe, that is just before the grains begin to harden, the ears can be boiled or roasted. This is one of the best ways to use maize. The grain, when mature, can be crushed and boiled like rice; or, it can be ground into meal and used in many different ways. Maize is a very valuable crop, and should be planted in nearly all gardens.

Eggplant is an herb about 70 to 80 centimeters high, and is grown for its large fruits which are edible from the time they are one-third the full size until they are ripe. There are a number of different varieties of eggplant which produce fruits of different shape, size, and color. The plants should be set out in rows from 70 centimeters to 1 meter apart, with the plants about 50 centimeters apart in the row. The fruits will mature in from ninety to one hundred and fifty days after planting. The fruit can be used in different ways, but is usually fried or boiled. This plant is grown in many parts of thè Philippines, and is an excellent garden vegetable.

Okra is grown for its seed pods, which are picked while young and tender for use in soups, stews, or as a vegetable. Okra should be planted in rows one meter apart, with the plants about 60 centimeters apart in the rows. The pods should be picked while they are young, and the plants should be picked clean daily. Okra may be used fresh, canned, or dried and kept for future use. The mature seeds are sometimes roasted and used in place of coffee.

Radish is a small herb that is grown for its fleshy root. There are different varieties, some of which have a long, white root, and others a root that is small, round, and red. Radishes should be sown in drills 15 to 30 centimeters apart, and thinned to 6 centimeters apart in the drill. Radishes may be grown at any

season of the year, but will thrive best in the cool season. The roots are eaten raw with salt, or they may be boiled.

Tomatoes are grown for the fruits which may be eaten raw or cooked. The seeds should be planted in the germinating bed and the plants transplanted to the garden when they are about 10 or 15 centimeters high. The rows should be about 1 to 1.5 meters apart with the plants 75 centimeters apart in the row. The plants should be tied to stakes or trellises when they are large enough to be in danger of being broken by the wind. A good trellis for tomatoes can be made of bamboo. The ripe fruits may either be eaten raw or cooked as a vegetable. The green fruits are cooked and used as pickles.

Carrots are cultivated for their roots. They should be planted in rows 25 to 40 centimeters apart. When the plants are well up they should be thinned to 6 centimeters in the row. The large varieties should be later thinned again to 12 centimeters in the row. Carrots will mature in from fifty to eighty days. The roots should be boiled until tender, and then seasoned with salt and pepper. They may also be boiled with meat.

Peppers.—There are different varieties of peppers, some of which have small, and others large, fruits. The seeds should be planted in the germinating bed, and the seedlings set out in rows 75 centimeters apart with the plants 40 centimeters apart in the row. When the plants produce a heavy crop, it is best to tie them to stakes. The fruits will mature in about twenty weeks. The large peppers may be stuffed with meat and baked. The small peppers are used for seasoning.

Lettuce is grown for its leaves, which are usually eaten without being cooked. It is a quick-growing plant and does best in the dry season. Lettuce can either be planted in shallow drills in the garden, or the seeds can be planted in the germinating bed and the young plants transplanted to the garden. The latter method will give the best results. The rows should be about 30 centimeters apart with the plants 15 centimeters apart in the row. Lettuce should be well cultivated so that it will make a rapid growth.

Mustard is a plant grown for its leaves, which are boiled and used as a vegetable. It should be grown in the dry season. Mustard may either be sown broadcast, or planted in drills. Only the young and tender leaves should be used.

Beets are grown both for the leaves, which are boiled and eaten as "greens," and for the fleshy roots. There are a number of different varieties. The seeds should be sown thinly in drills about 30 centimeters apart. The plants, when small, should be

thinned to 3 centimeters apart in the drill, and later thinned to 6 centimeters apart. The plants that are thinned out may be used as greens. In harvesting the roots, care should be taken to leave about 6 centimeters of the stalk attached to the root and not to bruise the roots or they will lose their color in cooking. Beet roots should be boiled until tender, and may be eaten with pepper, salt, and vinegar.

CONCLUSION.

In order to have a good garden it should be planted at the right season of the year, the land should be well prepared, good seeds should be used, and the garden should be cared for. Any person in the Philippine Islands who has a small piece of good land and is willing to do a little work can have a vegetable garden. If seeds and information about making gardens are desired they will be furnished by the Bureau of Agriculture.

THE SUGAR INDUSTRY IN THE PROVINCE OF PAMPANGA.

During the months of July and August, 1910, a preliminary investigation of the sugar industry of the Province of Pampanga was made by Mr. M. Brulay, an assistant agricultural inspector of the Bureau of Agriculture. The main object of this investigation was to obtain statistical information regarding the sugar industry in Pampanga, that might serve as a basis for future work in the development of the sugar industry in that province.

Sixteen municipalities, including all of the important sugar producing territory in the province, were visited by Mr. Brulay. Information was obtained covering the area of land cultivated to sugar cane in each municipality and on each plantation; the production, yield, consumption, and sales of sugar; the methods of milling; and other matters of interest.

These data, in so far as they could be reduced to figures, have been compiled and are included in the following table:

	Municipality.															Total for province.
	Angeles.	Apalit.	Arayat.	Bacolor.	Candaba.	Florida Blanca.	Guagua.	Lubao.	Mabalacat.	Magalang.	Mexico.	Porac.	San Fernando.	San Luis.	San Simon.	Santa Rita.	
Total number of sugar growers in the municipality	29	16	15	22	13	14	9	13	43	29	61	44	71	21	14	5	419
Total area of land actually cultivated in sugar at the present time, hectares	1,424	187	591	751	175	622	200	461	2,476	2,043	2,345	1,339	1,905	243	96	45	14,903
Total area of land actually cultivated in sugar during the year 1909, hectares	1,055	120	353	734	135	497	140	190	1,571	1,399	2,220	1,177	1,859	215	78	33	11,776
Total area of land adapted to sugar, but not so planted at the present time, hectares	762	271	1,705	745	215	635	124	319	450	1,802	2,110	1,383	1,366	447	255	83	12,672
Total production of sugar for the municipality for the year ending June 30, 1910, piculs	35,870	3,730	10,750	22,350	4,250	16,400	4,030	4,890	61,500	55,320	70,650	35,310	59,570	5,550	2,540	950	393,660
Total estimated production of sugar for the municipality for the year ending June 30, 1910, piculs	47,670	5,850	19,850	23,050	5,600	20,350	5,900	16,850	71,100	74,350	77,700	39,990	61,610	9,030	3,255	1,300	483,455
Average yield of sugar per hectare, piculs	33	32	35	30	32	31	31	31	30	35	33	30	31	32	33	29	32
Amount of sugar consumed in the municipality, or bartered in the immediate vicinity, during the year ending June 30, 1910, piculs	619	255	220	560	230	335	180	260	1,375	1,460	1,445	885	1,585	335	225	85	10,054
Amount of sugar sold at wholesale during the year ending June 30, 1910, piculs	33,591	3,475	9,950	21,790	4,170	16,065	3,950	4,640	59,580	53,440	69,595	34,965	55,235	6,715	2,325	865	380,351
Average cost of production, per picul	₱4.13	₱4.55	₱3.27	₱4.09	₱4.53	₱4.10	₱4.56	₱4.72	₱3.15	₱2.80	₱3.44	₱4.19	₱4.13	₱4.56	₱4.36	₱4.30	₱4.06
Average amount received, per picul	₱8.08	₱8.10	₱7.93	₱7.98	₱7.98	₱8.15	₱8.56	₱8.68	₱7.89	₱7.60	₱8.06	₱8.32	₱8.10	₱8.22	₱8.19	₱8.28	₱8.13
Total number of sugar mills in the municipality	26	17	15	23	11	16	9	15	43	26	64	44	73	20	15	5	422
Average horsepower of the sugar mills in the municipality	13	19	15	12	15	18	16	22	11	14	11	15	10	14	8	13	14

MONTHLY VETERINARY REPORTS.

SEPTEMBER.

RINDERPEST.

Pangasinan.—During the month rinderpest has existed in the municipalities of San Isidro, Agno, and Mangatarem. It has been practically eradicated from Agno and Mangatarem, leaving only certain barrios infected in the municipality of San Isidro.

Tarlac.—Two or three municipalities have been infected during the month, but the disease has not shown a very virulent form, and no great losses have been suffered.

Pampanga.—The towns of Mexico and Florida Blanca have harbored the disease during the past month.

Bulacan.—For a long time infection has existed in various barrios of this province. While the disease has not been of a really virulent type, the small force of men detailed in Bulacan have been unable to entirely eradicate it. No serious losses have been caused by the disease which has been prevalent in this province for the past two months, yet it has remained a seat of infection from which other provinces might become infected. The force of veterinarians in Bulacan is now being increased for the purpose of entirely eradicating the infection as soon as possible.

Zambales.—But one town has reported cases of rinderpest during the month of September. At present there are but two barrios infected and in these two barrios there have been but two or three cases each week.

Batangas.—This province has suffered far greater losses from rinderpest during the past year than any other province of the Islands, however, the disease has been almost entirely eradicated and only one municipality is considered infected at present. There has not been a case of rinderpest in the province for several days, and it will undoubtedly be considered free from disease in a very short time.

Iloilo.—A few cases of rinderpest recently appeared in the municipality of Santa Barbara, but the disease was quickly

stamped out with very little loss. The municipality of Miagao has harbored the infection for some time, but it has been confined to a few barrios and has not spread to the adjoining municipalities.

Occidental Negros.—With the exception of Batangas, no section of the Philippine Islands has suffered so severely from the ravages of rinderpest as has this province. This has been partly due to the large importation of foreign animals which are specially susceptible to disease after their long voyage on the sea; however, the infection has been almost entirely eradicated and disease now exists only in the tract of land situated between the towns of Bago and Valladolid. There have been so few cases during the past few weeks that it is believed this province will be entirely free from disease in a short time.

Oriental Negros.—This province has been practically free from rinderpest for the past two years. Recently carabaos were brought into Oriental Negros from Mindanao and rinderpest appeared among them a few weeks after their arrival. It is extremely probable that the importation of these carabaos was the cause of the disease again appearing in this province which had so long been free from rinderpest.

Cebu.—Two towns have been infected for several months. On this Island disease has shown that chronic form which causes little loss but proves so difficult to entirely eradicate on account of the field becoming so thoroughly infected that animals having very mild cases are able to travel about undiscovered.

Leyte.—A few months ago rinderpest suddenly appeared in several towns on this island. The disease has been eradicated in some of these towns, but six of them still remain infected.

CURRENT NOTES.

AN EXHIBITION OF THE PRODUCTS, INDUSTRIES AND NATURAL RESOURCES OF THE PHILIPPINE ISLANDS.

The following Executive Order, No. 55, was issued under date of September 22, 1910:

The Secretary of Commerce and Police, the Director of Prisons, and the Director of Navigation are hereby appointed a committee of three to study into the question of an exhibit of products, industries and natural resources of the Philippine Islands on the part of the Bureaus of the Insular Government, and of assistance by the Bureaus of the Insular Government to provinces in the preparation and bringing to Manila of such exhibits in order that they may be suitably displayed in the city of Manila in such a way as to inform the people of the Islands and visitors of the commercial, agricultural and industrial possibilities of the Islands.

All Bureau chiefs are directed to cooperate with the members of this committee to supply all information and data possible that may be useful to them in their labors.

This committee will have authority to take such measures as may seem to it wise to arrange for the collection, transportation and display of such articles.

MANILA HORSE SHOW.

According to the Daily Bulletin of October 8, the Manila Horse Show, which will be held about the end of January or the early part of February next year, promises to be the best horse show ever given in this city by the association.

At the last meeting the new officers were elected and the advance program for the entries is now in preparation and will be ready for distribution soon.

The society has many members and is in hopes of giving an excellent show the coming year as many well-bred horses have been imported for the occasion. There will be some fine displays, especially in the saddle and carriage classes. The Army will be well represented as the officers have a fine lot of animals.

At the last meeting the following officers were elected for

the coming year: President, Lieut. Col. G. P. Scriven, of the United States Army; vice-president, Mr. Richard Toovey, manager for W. F. Stevenson & Co.; treasurer, Mr. S. R. Brown; secretary, Mr. Salvador Chofre. Directors elect: Mr. P. G. McDonnell, Maj. William Lassiter, Capt. William Mitchell, Capt. Parker, aid to Governor-General Forbes, Mr. A. R. Roxas, Mr. F. L. Lawrence, and Mr. K. T. Austin.

A PROVINCIAL GOVERNOR HELPS THE FARMERS.

It is encouraging to receive information of a vigorous crusade by a provincial governor to create enthusiasm among the farmers of his province to better their condition. From the letters and proclamations issued by Governor Francisco Soriano of Surigao, it appears that he urges them to plant their lands at the end of the rice season with corn or mongos, explaining to them the advantage of so doing over allowing the weeds to grow and deplete the soil. For this purpose seed corn is being furnished by the Bureau of Agriculture.

Again in two executive orders the governor directs compliance with Act 1898 providing for the collection and preparation of statistical information. He properly holds that the prosperity of the inhabitants is largely in the hands of their elective representatives, whose constant endeavor should be directed toward encouraging the farmer to better his condition by studying improved agricultural methods.

It is hoped that the municipal authorities will respond to the instructions of the governor, for hearty coöperation on their part will result in an infinite amount of good to the people and the province. Governor Soriano's example may well be an incentive to other governors to carry on an active campaign for the betterment of agricultural conditions within their respective provinces.

The capital of a province is usually the center of its industrial activity, being the point where its crops are collected and in many cases both marketed and exported. Activity on the part of provincial authorities who can keep in touch with conditions, by disseminating through the municipal authorities information to the farmers as to what they can do to improve their products, and to get all out of their land which it is capable of producing, will do much good. The mere fact that interest in his welfare is being actively shown on the part of the officials elected by him will have a stimulating effect upon the farmer who, from his isolation, is apt to fall into a condition of indifference and the belief that he can not except much help from others.

SAMPLES OF THE PRINCIPAL PHILIPPINE WOODS.

All users of native timbers will be glad to known that they may now obtain authentic samples of practically all of the commercial woods of the Philippines. Each sample has been accurately identified and is marked with a label giving not only the scientific name but also the common name by which it is most generally known in the Islands. They are of convenient size, 4 by 6 inches (10 to 15 centimeters) with a thickness of $\frac{3}{8}$ inch (about 1 centimeter), with planed surfaces, and lend themselves readily for filing in a case or as desk samples or paper weights.

The identification of Philippine woods is by no means a simple problem even for an expert, and for the layman it is generally a hopeless puzzle. In the entire United States and Canada there are only about 110 commercial timbers; but in the Philippines there are at least 400. Naturally many of these resemble each other in color and grain, which added to the widely varying names, makes it impossible in many cases for the average consumer of timber to know what he is really getting and paying for.

For several years past the Bureau of Forestry has made a careful, systematic study of the woods of the Islands and has gathered wood and bark specimens from practically all of the trees of any commercial importance, as well as a great number from those whose scarcity, inaccessibility, and the absence of information concerning their qualities, have kept them out of the market except in rare instances. Labelled specimens of these woods are now offered for general distribution at a nominal price of 20 centavos each for the great bulk of the species, and at 40 centavos for a few which are hard to replace or whose toughness of grain makes their sawing and planing a slower and more expensive task. A list of these latter follows:

Agoho.	Ebony.	Bolongeta.	Enubing.
Liusin.	Camuning.	Betis.	Narig.
Dalinas.	Camagon.	Palo Maria.	Dungon-late.
Kuyus-Kuyus.	Tamayuan.	Ipil.	Dungon.
Alupag.	Mancono.	Bansalguin.	Oak.

All others come in the 20-centavo class.

All who wish samples may obtain them by addressing the Director of Forestry, Manila, P. I., and inclosing money order for the number of samples they desire. The weight of the samples averages about 4 oz. (113.39 grams) each, and if they are to be mailed to any point in the Philippines or in the United States 8 centavos per sample should be added.

MORO PROVINCE FAIR.

The Moro Province Fair will be held at Zamboanga February 1 to 7, 1911. This was decided upon by the executive committee at a meeting held Wednesday, September 28. The various committees appointed have gone to work with a will and the preliminary arrangements are already beginning to round into shape. It has been decided to hold the Fair on the large lot between the San Jose road and calle Carmen, generally known as the "school lot," provided the committee on buildings and grounds find that there is sufficient space. This will be an excellent location for the fair. It is centrally located and there is no other location large enough within 2 miles of the provincial capital.

The following is the executive committee: Gen. John J. Pershing, provincial governor, chairman; Mr. F. P. Williamson, vice-chairman; Maj. John P. Finley, district governor, second vice-chairman; Mr. F. L. Wilson, provincial treasurer; Col. Mark L. Hersey, director of constabulary, district of Mindanao; Mr. J. A. Hackett, editor Mindanao Herald; Mr. Francisco Barrios, merchant; Mr. John Spirig, merchant; Mr. Aurelio Saavedra, municipal president; Rev. Father J. McDonough, S. J.; Datu Raja Muda Mandi, headman, tribunal ward No. 2; Mr. Santiago Lledo.

The publicity committee is composed of the following: Mr. Charles F. Richmond, district auditor, chairman; Mr. John A. Hackett, editor Mindanao Herald, vice-chairman; Mr. A. Broad, merchant; Mr. Francisco Villaescusa, merchant; Mr. G. W. McClintock, merchant; Mr. P. J. Moore, attorney; Mr. Luis Lim, editor, Voz de Mindanao.

The following is the committee on exhibits: Mr. Charles R. Cameron, superintendent of schools, chairman; Capt. W. J. White, merchant, vice-chairman; Mr. C. S. Rivers, teacher; Mr. Ong Chua, merchant; Mr. Lorenzo Parragus, merchant; Mr. William M. Connor, jr., provincial attorney; Mr. A. Broad, merchant; Mr. John Spirig, merchant; Mr. F. Blum, merchant.—From Mindanao Herald, October 1.

LAPAC RUBBER PLANTATION, SULU.

The plantation is located on the Island of Lapac, Sulu District, Moro Province, P. I., and is in latitude 5° 32′ N. and longitude 120° 47′ E. It covers nearly all of the southern half of the island and contains 2,530 acres (1,023.89 hectares), the maximum allowed by law. The island itself is about 5 miles (8 kilometers) long in a northeast and southwest direction and

3 miles (4.82 kilometers) wide, having a small mountain at either end about 1,000 feet (364.8 meters) high, and a smooth rolling plain between the two hills extending from shore to shore. Lapac is separated from the Island of Siasi by a narrow channel about one-half mile (0.8 kilometer) wide. On this channel is situated the town of Siasi, where the Insular Government has a constabulary headquarters and a regular steamship and mail service from Zamboanga and Manila. Siasi, up to a few years ago an open port, is expected to be reopened in the near future and being on the direct route of all large steamers bound from Borneo and Singapore will give us direct communication with the foreign markets.

The soil is of a dark medium loam and very fertile. It is covered with a growth of short cogon grass, with here and there small patches of trees.

There is a more or less uniform rainfall the year around, while the nights give forth an extremely heavy dew which is almost equal to a shower.

The island is outside of the typhoon belt, and consequently the heavy destructive winds which are so common among the northern islands are absent here.

There are a number of small rivulets with one good-sized stream of pure running water which comes from a large spring at the foot of one of the small hills.

Rubber.—We have three patches of Ceara and one of Para planted as follows:

Ceara: Patch number one contains about 1,500 trees, which were planted during the latter part of 1909. These trees are now from 16 to 18 feet (about 5 to 5½ meters) in height and are all in good, healthy condition. Patch number two contains 2,000 trees, planted during the months of January and February, 1910. They average about 5 feet (1.52 meters) in height and are all doing well. Patch number three contains 4,000 trees, which were planted during the latter part of April and the first part of May, 1910. This makes a total of 7,500 Ceara trees now planted and all growing.

Para: We have planted 3,200 Para rubber trees, which were set out from stumps during the months of April, May, and June, 1910. These trees are all alive and the majority have started to throw out shoots and branches. In addition we have made arrangements with a Borneo estate to ship us monthly 1,000 two-year-old Para rubber stumps, which we expect to set out in monthly lots.

We have a large number of plow gangs working, and by

November 1, 1910, expect to have 12,000 Ceara, 7,000 Para, and 1,000 Castilloa planted, giving us a total of 20,000 rubber trees.

Coconuts.—We have 2,000 coconuts in the seed beds, the majority of which have already sprouted, these will be set out on the first day of September, 1910. As it is the intention of the company to make rubber the principal crop, we have not intended planting more than from two to three thousand yearly.

Peanuts.—Peanuts are planted between the rubber as soon as it shows a good growth. They mature in three months, and the yield is from 7 to 9 piculs per acre (0.4 hectare). They are now being sold in the local market at from 7 to 9 pesos per picul. From two to three crops can be harvested annually. Planting peanuts between the rubber and coconuts enriches the ground, keeps down the grass and weeds, and brings in a certain amount of revenue while the older crops are maturing.

Roads.—We have laid out and improve about 15,500 feet (4.72 kilometers) of permanent roadways. The estate has been laid out in square fields, each field containing approximately 25 acres (10.11 hectares). These fields are divided from one another by roadways 24 feet (7.31 meters) wide, while the road bounding the plantation is 30 feet (9.14 meters) in width. These roads are improved as the fields adjoining them are planted to permanent crops.

Labor.—We consider that we have more, better, and cheaper labor in this immediate vicinity than can be obtained in any other part of the Philippine Islands. So far we have been able to use only a very small percentage of the labor actually available, all of which lives on and in the immediate vicinity of the estate. Up to date it has been the policy of the company to encourage all surplus labor to cultivate the little patches of ground around their houses, thereby keeping them contended and in good spirits, in order that if at any future date we may need them on the estate they will be at hand.

The established wage for labor on Lapac is as follows:

Daily labor.—Men receive 40 centavos, women and boys receive 20 centavos.

Monthly labor.—Men receive a monthly wage of 10 pesos, women and boys 5 pesos. Men using American machinery are paid 1 peso per month extra. All laborers are paid in cash. All laborers up to the present time have been required to subsist and house themselves. The only extra expense, in addition to their wages, has been a little medical attention for themselves and their families.

While the above is a saving to the estate, it is nevertheless recommended that at some time in the future barrack houses and individual shacks be built for the laborers.

We have a total of seventeen large work animals, each one of which is capable of and is now pulling a one-handled American plow, especially made for the use of the native and for work in this particular soil. In addition to the above we have four saddle horses, three cows with calves and one 10-months-old calf.—Extracts from the report of Mr. Henry Hasemeyer, manager, in the Mindanao Herald, September 24, 1910.

MONTHLY CROP REPORTS.

SEPTEMBER.

RICE.

Pangasinan.—On account of the lack of sufficient rain during July and August the planting of the rice crop was retarded and, in some instances, it had to be replanted. With the heavy rains that have occurred during the month of September the prospects have greatly improved and a good crop of rice for the coming season is now expected.

Tarlac.—The planting of the rice crop has been delayed because of the lack of rain, and in many places no rice appears to have been transplanted, the young rice in the seed beds having wilted. During the latter part of the month the rains have been frequent and a great deal of rice is now being planted. In places where an abundant supply of water has been obtainable rice is looking well.

Zambales.—There has been sufficient rainfall during the month and most of the rice is looking well excepting a few fields which suffered heavily from the drouth early in the season. A little rice was still being planted at the first of the month, completing the work for the season. At the end of the month rice harvesting was just beginning on the early planting.

Bataan.—The rice crop in this province is in good condition and promises a good harvest with the exception of a few *caiñgin* rice fields which were planted early and suffered from drouth during the month of June.

Tayabas (Boac).—During the latter half of September, there has been frequent rains which have greatly benefited the rice crop. The rains were too late, however, to materially benefit the crop which was planted early, and early rice will not yield much more than half of a normal crop.

Ambos Camarines.—Owing to the long dry season, without the usual July rains to prepare the soil for planting, the rice crop will be late this season. A number of planters have stated that the prospects at present are for a larger acreage planted to rice than for many previous years. It is also stated that under climatic conditions in this province the yield from a late crop is likely to be more than when the season comes earlier. As

the crop is just being planted, however, it will be several months before this can be determined.

Oriental Negros.—Heavy showers have been frequent during the month throughout the province, and the farmers have taken advantage of them to plant their rice fields.

Occidental Negros.—The early part of the month was rather dry, but later there was considerable rainfall which gave the rice growers an opportunity to begin planting a late crop of rice. Rice is bound to be short in this district. Very little planting has been done yet, and it is still too dry for satisfactory planting.

Capiz.—In this province most of the rice crop will be ready by next month and a large yield is anticipated.

Iloilo.—The rainfall has been abundant for the month of September and consequently all of the rice fields that were ready have been planted. By the 10th of October, if the rains continue, all of the rice fields will be under cultivation. It has been predicted that the rice crop of Iloilo Province will be 50 per cent short as compared with that of last year. Most of the farmers state, however, that if the crop does fall short, it will not be more than one-fourth. Very little rice is being planted in the southern part of the province because of the late rains. There are large areas being plowed at the present time, and probably much more than will ever be planted. This is particularly true in the municipalities of Santa Barbara, Pototan, Passi, and other places where they are not able to irrigate. New rice is now making its appearance in some of the markets.

ABACÁ (MANILA HEMP).

Ambos Camarines.—The production of abacá seems to be about normal, although some planters state that they are thinking seriously of destroying their abacá fields and planting coconuts and cacao where the land is adapted to these crops on account of the low price of abacá.

Sorsogon.—The price of the better grades of abacá has advanced about 50 centavos per picul and large amounts of this fiber are now being brought into the market.

Tayabas (Santa Cruz).—Abacá is in good condition in this locality, but on account of lack of labor and poor transportation it is almost impossibe to supply the demand of the market.

SUGAR CANE.

Occidental Negros.—Sugar cane is in excellent condition and the planters are getting their mills in condition to begin grinding at as early a date as possible. Large areas have been planted

to sugar cane and a number of new haciendas have been started since the rise in the price of sugar.

Iloilo.—Sugar cane is approaching maturity and a large crop is expected this year. A considerably increased area is already under cultivation for next year's crop.

Bataan.—Sugar cane is reported to be in good condition and a good harvest is expected.

Batangas.—For the past month there have been heavy rains accompanied by wind which have done slight damage to the sugar crop. This damage will be reparable unless worse storms are experienced. In the municipality of Balayan, preparation is being made to harvest a large sugar crop, new mills are being installed and old ones are being repaired. There has been a large increase in the importation of work animals in this municipality.

COCONUTS.

Ambos Camarines.—The planting of coconuts is receiving more attention in this province than formerly, and everyone who can afford to do so is planting coconut trees. The province has thousands of hectares of land which should be excellent for growing this crop. The recent rise in the price of copra has led the people to appreciate the importance of this product.

Tayabas (Santa Cruz).—In places where coconuts are found, the crop is good, but poor transportation makes it impossible to handle a large amount of copra.

TOBACCO.

Bohol.—A very small amount of tobacco is now grown in this province, but it is of very good quality.

Iloilo.—There is a great deal of enthusiasm among tobacco growers on account of the tobacco prizes.

Isabela.—The tobacco crop has been harvested for some time. Large buyers have not yet commenced buying and probably will not until October. Some small sales have been made to the Chinos who made credit sales of rice and other supplies at inflated prices to be paid for in tobacco at the time of harvest. The tobacco crop is reported by both growers and buyers as larger than that of last year. Growers state that the quality is better; buyers generally insist that it is poorer. The price will undoubtedly be lower than last year. The buying system does not encourage the tobacco growers of this section to strive for quality. The largest buyers lump the grower's crop and make bulk offers which the grower can not figure out. Unless the

buying system can be improved, improvement of the output can hardly be expected.

CORN.

Bohol.—Corn ranks next to rice in this province. There is a very general demand for a supply of improved seed corn, but there also appears to be a general opinion that where good seed is planted it is unnecessary to give any further attention to the growing crop. It is believed that the distribution of a small amount of good seed corn to each American supervising teacher in the province for planting in the school gardens would be desirable. Where corn is so planted and gives satisfactory results the farmers are sure to hear of it through the children in the schools.

Zambales.—Corn grown from the "Mexican June" seed, which was distributed in this province by the Bureau of Agriculture, is doing very well. The farmers are much pleased with the results obtained and are anxious for more seed.

Isabela.—Corn is now being harvested and in most places the yield is very good.

Cagayan (Tuguegarao).—The municipal president reports that a splendid crop of corn, consisting of about 3,000 carloads, has been harvested. The crop planted in May is in bad condition, due to the hot weather of May and June. The amount of corn already harvested, and that to be harvested, will hardly suffice for the local needs of the people.

Ilocos Sur, Abra.—The "Mexican June" corn sent to Abra during the past season gave excellent results, not only to those who planted it, but also to those farmers whose lands are contiguous to those who planted this corn as the pollen was carried to the near-by fields and on coming in contact with the native variety, a very desirable cross was obtained.

A small corn sheller, sent to Abra by the Bureau of Agriculture, has already been used for shelling 900 sacks of corn. A number of the farmers in this section have recently ordered corn shellers and grinders, and there appears to be a very considerable amount of interest in modern agricultural implements and machinery.

Cebu (Barili).—"Mexican June" corn planted in this municipality has given excellent results. One-half a ganta and one-half a chupa of seed planted yielded 6 cavanes of corn. One thousand first-class ears of the corn usually planted here yield at most 45 gantas, while 1,000 ears of "Mexican June" grown under the same conditions yielded more than 68 gantas.

NOTES FROM OTHER FIELDS.

RICE AND ITS BY-PRODUCTS AS FEEDING STUFFS.

Farmers' Bulletin No. 412, published by the United States Department of Agriculture, contains some interesting information under the above title regarding the value of rice as a feeding stuff for live stock. It is based on experiments performed at various State experiment stations, particularly in Louisiana.

It is stated that 162 pounds (72.9 kilograms) of rough rice, or paddy, have been found to be equivalent in feeding value to 174 pounds (78.3 kilograms) of corn, and that both white and red rice are valuable. Rice straw contains on an average 4.72 per cent of crude protein, 32.21 per cent of carbohydrates, and 1.87 per cent of fat. When well preserved its sweetness and excellent flavor add materially to the feeding value, and animals will consume large quantities of it.

"Rough rice consists of the grain proper with its close-fitting cuticle roughly inclosed by the stiff, hard husk, or hull. The object of milling is to produce clean rice by removing the hull and cuticle and to polish the surface of the grain. The by-products which result from milling consist of hulls, bran, and polish. One bag of rice (162 pounds or 72.9 kilograms) should produce about 100 pounds (45 kilograms) clean rice, 7 pounds (3.15 kilograms) rice polish, 20 pounds (9 kilograms) rice bran, and 35 pounds (15.75 kilograms) chaff or hulls. Grits or broken grains of rice are found in the bran and polish." Grits are said to have a high feeding value, but are extremely hard to break up and are not easily affected by the digestive juices of the animal. As they form in some cases as high as 25 per cent of rice feeds, the digestibility of the feeds would be much increased if they could be ground up or removed during milling.

Rice meal, which should properly consist of pure rice bran, is stated to be as a rule composed of bran, polish, and hulls, as it is found on the market, and its feeding value is uncertain, unless guaranteed by a chemical analysis.

Rice hulls, composed mainly of fiber and mineral matter, are "worthless as a feed, and when fed in large quantities are positively harmfull."

Rice bran, which should consist of the outer layer of the rice kernel, together with some of the germ, is the most nutritious of the rice feeds, but as the commercial product contains more or less hulls, its feeding value varies. The Louisiana Experiment Station has adopted as a standard for good rice bran 12.5 per cent protein, 10 per cent fat, not over 10 per cent fiber, and not over 9 per cent ash.

A good rice bran is said to be better than corn or corn meal if it smells sweet, but if it becomes rancid because of the decomposition of the fatty material, cattle do not like it. It is suggested that rancidity may be prevented by removing the fat or by heating the bran to 200° F. soon after milling. The only cases in which the cattle showed a distaste for rice bran were when it was rancid.

Following is one of the rations tried successfully at the Louisiana station on horses and mules: 15 pounds (6.75 kilograms) cowpea hay, 8 pounds (3.6 kilograms) rice meal, 8 pounds (3.6 kilograms) corn. The amount of digestible protein in such a mixture is approximately 1.125 kilograms, and the amounts of digestible fat and carbohydrates about 6.75 kilograms.

Rice polish contains less fat and protein than rice bran, but a higher percentage of starch. It appears to be used in a variety of ways, such as for stuffing material for sausage, and for making buttons. Analyses show the content to be as follows: 10.13 to 15.5 per cent protein, 4.44 to 14.26 per cent fat, 51.73 to 70.30 per cent carbohydrates, 0.51 to 4.87 per cent fiber. "In five experiments at the Alabama station rice polish was found superior to corn meal in feeding pigs. One pound of gain required only 3.73 pounds of rice polish, as compared with 4.74 pounds of corn meal. Hence 78.6 pounds (35.17 kilograms) of the polish are equal to 100 pounds (45 kilograms) of corn meal."

SUGAR IN HAWAII.

According to the Hawaiian correspondent of the Louisiana Planter, the prospects are that the returns for 1910 will show the best average ever attained in the sugar industry in Hawaii. By the first of August a large majority of the plantations had concluded the grinding season.

The newly completed lower Hamakua irrigation ditch is hailed as the greatest accomplishment from an engineering and irriga-

tion standpoint in Hawaii. This enterprise was financed by Hawaiian capitalists at a cost of more than 2,000,000 pesos, and is for the purpose of furnishing three of the big sugar plantations belonging to the Pacific Sugar Mill with an unfailing supply of water for irrigation purposes. The system of tunnels through the Kohala mountains is the second largest in the world. There are 9 miles of open tunnel and 15 miles of open ditch. In one place a tunnel over a thousand meters long was made through a mountain for the purpose of connecting two important streams. The tunnels are all cement and stone lined where necessary, and the open ditch and tunnels through the plantations are all cement lined with plaster reinforced by wire netting. It is stated that about 3,000 barrels of cement and 10,000 cubic yards of sand were used in constructing the open ditch through the plantations, and about 6,000 barrels of cement were used for stone lining and cement plastering the mountain system of tunnels. About 3,500 cubic yards of stone masonry is used on flume piers, and about 1,000,000 feet of timber were used in general construction work. In spite of the enormous expense attending this work and the obstacles of every kind that had to be overcome, the success of the undertaking is now demonstrated, and the permanent protection against drought which it furnishes will far more than offset the millions of dollars that have been lost in the past for lack of just such an adequate and dependable water supply.

SUGAR IN MARITIUS.

A recent publication (No. 13) from the chamber of agriculture, colony of Mauritius, deals with the sugar output from that island for the past year. It is stated that the total production of the island has amounted to 252,904 tons. These figures represent the amount of sugar actually put out by the factories, of which there are 65. The total exportation has amounted to 235,184,264 kilograms net weight, and the average price has been about Rs. 8.50 (₱8.25) per kilo.

Sugar has been raised for a long time in Mauritius, and the fact that in 1860 there were 252 factories shows that here as in other places the tendency is toward having fewer mills of larger capacity. Some tables given show that only 10 of the 65 factories now in operation crush less than 200 tons of cane per day, while nine crushed more than 500 tons. The minimum output per factory for the season was 14,047.6 tons, and the maximum 126,682 tons.

While 93.39 per cent of the proprietors of sugar land are Indians, these are as a rule very small holders, whose average

individual contributions of cane to the factories do not exceed 25 tons.

In speaking of the time required for the sugar-milling season in other countries it is stated that in Java the crushing requires from six to seven months, extending from May to October, with a minimum of 125 days. In Java the planters have "adopted a most practical method of cultivating concurrently, and in the required proportions, both slow and quick growing varieties of canes. This enables them to keep the factories at work for a longer period of the year, harvesting perfectly mature canes all the while. By this means they are spared the necessity of working with feverish haste as would be the case if they had to compress their whole crop within the short space of 100 days."

AMERICAN TOBACCO IN TONKIN.

Bulletin Economique (No. 84) states that in October, 1909, the bureau of agriculture, forests, and commerce obtained some seeds of well-known American tobaccos, and proceeded to experiment with them in the botanical and acclimation garden at Hanoi. The seeds were planted in boxes, under glass, on November 10, 1909, and began to sprout on November 16. The young plants were set out early in January in rows 1 meter apart, the plants 90 centimeters apart in the rows. The growth has been very good, and the plants have not been attacked either by disease or insects.

The following table will indicate some of the results that were obtained:

Variety.	Date of setting out the young plants.	Date of flowering and topping.	Date of harvest.	Average size of leaves. (cm.)
Kentucky tobacco:				
1. Clarkeville, No. 12017 (dark)	Jan. 6	Feb. 9	Apr. 10–17	42 x 18
2. Clarkeville, No. 12017 (dark, air cured)	Jan. 8	Feb. 28	Apr. 26	45 x 10
3. White Burley, No. 12018	Jan. 7	Feb. 3	Apr. 26	42 x 18
4. Green River, No. 12017 (brown)	Jan. 6	Mar. 16	Apr. 28	43 x 17
Virginia tobacco:				
1. Blue Pryor, No. 12018 (dark)	Jan. 11	Mar. 15	Apr. 28	60 x 24
2. Orinoco yellow, light, No. 12018 (brown)	Jan. 6	Mar. 12	Apr. 26	40 x 12
Maryland tobacco	Jan. 6	Mar. 15 Mar. 17	Apr. 19–22	45 x 20
Brazilian tobacco, Bahia, No. 11018	Jan. 6	Feb. 28	Apr. 24–26	50 x 24

MARKET REPORTS.

THE FIBER MARKET.

Compiled by M. M. SALEEBY, *Fiber Expert.*

The following data on the London market taken from Messrs. Landauer & Co.'s Weekly Market Report, dated London, August 31, 1910, it is believed will interest fiber growers in these Islands.

MANILA HEMP.

In London and Liverpool we have experienced a fairly active week. Prices in some instances have been a shade lower than those ruling during the previous week. Shippers met the demand very freely. We estimate sales at 15,000 bales, including Fair Current at £20[1], Superior Seconds £19 to £19/5–, Good Seconds at £18/15– to £19, and Good Brown at £18/10– for October to December and November to January shipment. At the close the market is steady, with less pressure for business on the part of sellers.[2]

Fine hemp is in fair request, but the quantity offered is insignificant.

Spot hemp has ruled steady. The quantity offered is very small, though at the same time the demand is anything but brisk. Values are nominally £20/5– to £20/10– for Fair Current, £19/10– Superior Seconds, and £19 to £19/5– for grades below.

General values are:

[English currency.]

	Spot close by.	June to August.	October to December.
Best marks	42/– to 44/–	42/– to 43/–	40/– to 43/–
Good marks	40/– to 41/–	38/– to 40/–	38/– to 40/–
Good current	34/– to 35/–	34/– to 35/–	33/– to 33/6
50% to 75% over Current	29/– to 30/–	28/– to 29/–	27/– to 29/–
25% over Current	24/– to 25/–	23/6 to 24/–	23/– to 23/6
Fair Current	20/6 to 21/–	19/6 to 20/–	20/– to 20/3
Superior Seconds	20/– to 20/3	19/3 to 19/6	19/3 to 19/6
Good Seconds	19/9 to 20/–	19/– to 19/3	19/– to 19/3
Fair Seconds	19/3 to 19/6	18/6 to 18/9	18/6 to 18/9
Good Brown	19/– to 19/3	18/3 to 18/6	18/3 to 18/6
Fair Brown	19/– to 19/3	18/– to 18/3	18/– to 18/3
Manila Hemp Strings	14/– to 14/6	13/– to 13/3	12/6 to 13/–

[1] One pound equals about 10 pesos Philippine currency.

[2] Above quotations are per ton. One metric ton equals approximately 16 piculs.

SISAL HEMP.

The market is unchanged in New York at 4⅜ to 4½ cents, equal to £21/10– to £22, c. i. f. Europe.

MANILA MAGUEY FIBER.

We quote No. 1 in store at £18. For forward shipment £17 is asked for No. 1, and £15/10– for No. 2.

NOTES ON MANILA MARKETS FOR SEPTEMBER.

By KER & Co.

Based on advices

From—	Date.	From—	Date.
San Francisco	Aug. 23	Cebu	Sept. 24
London	Sept. 2	Hongkong	Sept. 27
Singapore	Sept. 22	Iloilo	Sept. 27

SUGAR.

Manila and Cebu.—No arrivals.

Iloilo.—Some business reported in spot No. 3 for Northern ports of China at ₱6.60 f. o. b. Small arrivals of new crop are looked for about end of next month.

HEMP.

Market closes quiet with little hemp on offer, arrivals being delayed by bad weather. We quote Current for U. K. ₱8.25 per picul. Prices of better qualities are maintained. Receipts for the nine months at all ports were 1,006,650 bales, compared with 956,258 bales for the corresponding period of 1909 and 743,336 in 1908.

COPRA.

Steady at ₱11.25 fair merchantable and ₱12.12½ Cebu fair merchantable sun dried per picul—buyers.

Distribution of principal Philippine exports for the nine months (January to September, 1910.)

Products exported.	United States.	China.	Pacific Coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Malay States and India.
Dry sugar, tons	82,681	14,339	12,932					6
Hemp, bales	428,579	11,511	37,962	363,907	54,041	16,654	11,750	8,436
Copra, piculs	5,600		72,320	22,400	1,066,608		4,021	
Cigars, thousand	34,742	28,797	23,155	6,017	14,990	11,020	327	13,290

ILOILO SUGAR MARKET FOR AUGUST AND SEPTEMBER.

By FIGUERAS HERMANOS.

The amount of sugar received from the mills and sugar districts during the month of August amounted to 29,800 piculs and 14,410 piculs for the month of September. The sugar market during September has been very quiet and the quotations were only nominal as there were no buyers.

The sugar market during August dropped. from 8 pesos and 4 reales [1] on the 1st to 8 pesos and 3 reales on the 3d; on the 15th it again dropped to 8 pesos and 2 reales and after the 23d there were no buyers.

For September the quotations were only nominal. No price was quoted until the 12th, when 6 pesos was offered. This price continued until the 23d, when it went up to 6 pesos and 1 real and again on the 27th to 6 pesos and 2 reales, which price continued until the close of the month.

August and September shipments.

[In piculs.]

Date.	Vessel.	Destination.	Superior.	Wet.
August 4	Kenley	New York via Manila	81,600	
August 10	Kennebec	United States via Cebu	51,600	
August 10	Tringganu	Singapore via Cebu	1,600	
August 10	Tropea	Marseilles via Manila	8,000	
August 20	Seneca	United States via Manila	88,000	
September 9	Kaifong	Hongkong via Cebu	1,440	
September 10	St. George	United States	88,000	
September 19	Welsh Prince	United States	24,000	
Total for August and September			344,240	

Exports up to October 2, 1910.

[In piculs.]

To—	1908–9 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
Uuited States	544,400		1,222,800	
Japan	50,667	8,915		
China	768,482		86,652	486
Total	1,363,549	8,915	1,309,452	486

[1] 1 real=12½ centavos.

ESTIMATED ILOILO SUGAR CROP 1909–10.

Stocks, September 30, 1910.

	Piculs.
No. 1 sugar	62,540
No. 2 sugar	5,700
No. 3 sugar	35,760
Wet	16,630
Current	3,580
	124,310
Exports to date as per our Circular No. 48	1,309,938
	1,434,248
Less stock on hand October 30, 1909	28,298
	1,405,950
Estimated arrivals	11,000
Estimated crop for 1909–10	1,416,950

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

AUGUST, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	11,662,913	6,018,565	3,945,406	199,550	409,808	1,220		22,237,462
	Value	Dollars	338,116	193,563	115,565	7,625	13,971	55		668,895
Beef cattle	Quantity	Number	3,968		153					4,121
	Value	Dollars	79,097		2,734					81,831
Sugar	Quantity	Kilos	358,879	16,423	46,636	6,337	8,025	102		436,402
	Value	Dollars	24,855	1,272	3,296	436	522	11		30,392
Coffee	Quantity	Kilos	160,120	2,038	3,432	902	4,459	8		170,959
	Value	Dollars	36,666	505	747	216	1,047	3		39,184
Cacao	Quantity	Kilos	65,907	1,895			2			67,804
	Value	Dollars	16,534	506			2			17,042
Eggs	Quantity	Dozen	300,059		215					300,274
	Value	Dollars	22,919		21					22,940
Raw cotton	Quantity	Kilos								
	Value	Dollars								

EXPORTS.

Hemp	Quantity	Kilos	8,958,618	2,805,765						11,764,383
	Value	Dollars	881,761	326,960						1,208,721
Sugar	Quantity	Kilos	533,154		14,136,351					14,669,505
	Value	Dollars	30,943		892,224					923,167
Copra	Quantity	Kilos	7,637,510	2,293,882	599,017	121,234	343,854			10,995,497
	Value	Dollars	628,641	215,777	56,720	10,044	28,353			939,535
Cigars	Quantity	Thousand	12,784		1					12,785
	Value	Dollars	168,156		16					168,172
Cigarettes	Quantity	Thousand	2,270							2,270
	Value	Dollars	1,890							1,890
Tobacco	Quantity	Kilos	566,029							566,029
	Value	Dollars	87,649							87,649

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS—Continued.

SEPTEMBER, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	10,020,347	5,075,066	2,310,973	137,872	298,060	1,031		17,843,349
	Value	Dollars	227,303	166,074	75,335	5,685	11,970	45		486,412
Beef cattle	Quantity	Numbers	2,488		338					2,826
	Value	Dollars	38,010		5,154					43,164
Sugar	Quantity	Kilos	191,726	24,907	4	8,973	6,111	411		232,132
	Value	Dollars	13,623	2,005	1	637	450	40		16,756
Coffee	Quantity	Kilos	48,054	101	381	420	3,720	18		52,694
	Value	Dollars	12,038	40	196	108	906	6		13,294
Cacao	Quantity	Kilos	64,095	15,952	165					80,212
	Value	Dollars	16,505	4,306	117					20,928
Eggs	Quantity	Dozen	293,033				187			293,220
	Value	Dollars	24,962				12			24,974
Raw cotton	Quantity	Kilos								
	Value	Dollars								

EXPORTS.

Hemp	Quantity	Kilos	8,327,664	2,320,500		11,278				10,659,442
	Value	Dollars	791,801	257,569		1,054				1,050,424
Sugar	Quantity	Kilos	280,279		7,262,145					7,542,424
	Value	Dollars	16,000		441,740					457,740
Copra	Quantity	Kilos	7,509,510	2,780,218	352,898	346,122	341,223	1,761		11,331,732
	Value	Dollars	652,230	260,501	33,480	12,578	31,291	95		990,175
Cigars	Quantity	Thousand	13,969							13,969
	Value	Dollars	164,859							164,859
Cigarettes	Quantity	Thousand	2,609							2,609
	Value	Dollars	2,186							2,186
Tobacco	Quantity	Kilos	1,168,891							1,168,891
	Value	Dollars	150,508							150,508

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

SEPTEMBER, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	28.2	------	28	------	27.4	9.2	28	0.8	28.9	------	28.6	0.5
2	28.7	------	28.9	------	28.1	4.1	27.8	5.6	29.4	------	26.3	4.5
3	26.9	13.7	28.2	------	27.8	44.9	28.2	1	28.8	------	27.7	------
4	27.5	------	27.6	------	27	4.6	27.5	34.3	28.4	------	27.2	3
5	26.4	40.9	27.4	------	26.2	10	27	12.4	26.5	5.9	26	57.2
6	28.1	------	28	9.1	27.4	5.8	27.6	22.8	25.4	4.9	26.5	103.9
7	28	------	28.4	------	27.1	------	28.3	4.3	26.4	13.5	26.2	4.1
8	26.5	.3	27.5	------	26.7	45.7	28.4	2.5	26.8	.5	27.9	21.6
9	27.7	6.8	26.8	30	26	.3	28.4	70.6	26.8	2.8	27.2	6.6
10	27.1	------	27	14	25.9	1.5	28.2	------	26.6	------	26.2	------
11	27.3	6.7	27	2.3	26.8	------	27.8	20.6	27	------	27.5	1.8
12	27.7	1.8	26.4	1.5	26.2	4.8	28.2	------	27.6	------	27.7	------
13	26.1	7.1	26.3	2.8	25.1	37.4	28.4	------	28	------	27.4	------
14	26.6	------	26.6	4.6	25.2	23.8	26.7	5.4	26.4	14.2	27	------
15	26.4	42.2	25.6	6.4	25	38.7	27	------	27.3	------	26.9	------
16	25.2	13.3	26.6	1.8	25.4	30.5	27.2	9.1	27	.3	26.9	2.5
17	26.3	------	27.4	.5	26.3	.8	27	1.3	26.6	3.8	27	24.4
18	26.8	11.7	27.8	------	26.8	------	28.8	14	27.1	46.2	27.1	1.8
19	26.6	------	26.2	4.1	26.3	6.6	27.8	.5	26.8	------	26.7	4.1
20	25.6	18.5	25	40.1	25.2	17.5	27.6	------	27.3	------	26.5	------
21	24.7	22.8	26.1	9.2	24.6	13.1	27.9	15.2	27.3	------	27.2	------
22	26.4	------	26.9	------	26.5	1.3	28	29.4	26.5	1.3	27.6	1.8
23	26.3	------	28.1	------	26.7	2.5	28.4	4.3	27.1	50.3	27.2	1
24	27.3	------	27.8	------	26.8	------	26.6	30.5	25.7	23.6	25.6	66
25	26.4	18.1	27.1	6.6	26.6	1	27.8	------	27.3	------	26.9	16.8
26	25.9	1.8	26.1	20.9	25.7	.5	28.7	------	26.5	7.6	27.2	1.5
27	26.4	43	26.7	16.6	26.1	30.5	27.5	6.1	26.8	------	27.6	4.6
28	26.5	2	27.1	------	25.1	40.1	27.6	16.5	25.9	2.5	26.4	55.1
29	27.1	------	27.9	------	25.5	38.9	27.2	51.6	27.1	------	26.8	4.4
30	27.6	2.8	28.4	------	26.3	18.3	27.2	2.5	27.2	52.4	28	.5

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING MARCH 31, 1910.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Agusan:		*Hectares.*	*Hectares.*		
Rice	Good	341	50	63,750	Liters.
Abacá	do	8	12	10,436	Kilos.
Copra	do			18,384	Do.
Albay:					
Rice	do	599	2,050	6,613,522	Liters.
Abacá	do	1,398	28,248	3,909,138	Kilos.
Copra	do			415,393	Do.
Corn	Fair	124	87	52,575	Liters.
Ambos Camarines:					
Rice	do	11,644	10,579	8,457,445	Do.
Abacá	do	638	6,667	409,328	Kilos.
Copra	do			288,880	Do.
Corn	do	135	290	483,930	Liters.
Antique:					
Abacá	Good	27	80	17,163	Kilos.
Copra	do			49,129	Do.
Sugar cane	do	1,116	1,348	2,663,003	Do.
Tobacco	Fair	54	9	690	Do.
Corn	Good	355	86	27,900	Liters.
Bataan:					
Rice	Fair	327	1,025	2,170,025	Do.
Sugar cane	do	156	331	529,364	Kilos.
Corn	do	30	23	15,250	Liters.
Batangas:					
Rice	do	70	2,291	904,650	Do.
Abacá	do		271	58,686	Kilos.
Sugar cane	do	52,429	13,082	10,537,850	Do.
Tobacco	do	50	57	21,166	Do.
Corn	Poor	593	1,695	3,233,341	Liters.
Bohol:					
Rice	Fair	2,736	1,600	2,422,326	Do.
Abacá	do	38	5,956	892,162	Kilos.
Copra	do			451,928	Do.
Sugar cane	do	75	74	56,483	Do.
Corn	do	1,278	878	697,469	Liters.
Bulacan:					
Rice	do	5,829	12,149	17,402,475	Do.
Sugar cane	do	2,222	1,368	1,669,599	Kilos.
Tobacco	do	623	55	140,890	Do.
Corn	do	234	1,887	1,649,637	Liters.
Cagayan:					
Rice	do	520	11,979	11,829,600	Do.
Tobacco	do	8,096	862	445,280	Kilos.
Corn	do	1,927	1,324	1,005,700	Liters.
Capiz:					
Rice	Good	350	6,522	3,065,800	Do.
Abacá	Fair	122	1,711	93,034	Kilos.
Copra	do			574,462	Do.
Tobacco	do	860	831	270,795	Do.
Corn	do	472	262	221,975	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Cavite:		*Hectares.*	*Hectares.*		
Rice	Good	609	7,074	8,136,750	Liters.
Abacá	Fair		368	58,225	Kilos.
Sugar cane	do	335	575	279,101	Do.
Corn	do	127	325	293,550	Liters.
Cebu:					
Rice	do	346	1,888	1,300,600	Do.
Abacá	Good	265	1,102	257,154	Kilos.
Maguey	do	293	741	335,691	Do.
Copra	do			1,128,980	Do.
Tobacco	Fair	1,232	1,260	398,739	Do.
Corn	do	5,016	18,527	10,654,697	Liters.
Ilocos Norte:					
Rice	do	2	15,294	17,925,225	Do.
Maguey	do	110	78	121,573	Kilos.
Sugar cane	do	1,002	1,191	1,676,645	Do.
Corn	do	567	194	303,076	Liters.
Ilocos Sur:					
Rice	do	56	1,799	1,663,968	Do.
Maguey	do	270	2,784	1,513,349	Kilos.
Sugar cane	Good	3,273	2,675	4,867,906	Do.
Corn	Fair	1,422	852	1,316,371	Liters.
Iloilo:					
Rice	do	9	6,554	6,875,612	Do.
Abacá	Good	9	279	70,844	Kilos.
Sugar cane	Fair	2,472	4,018	5,088,589	Do.
Tobacco	do	609	3,119	441,744	Do.
Corn	Good	361	149	57,445	Liters.
Isabela:					
Rice	Fair	1,154	503	274,024	Do.
Tobacco	Good	12,689	885	533,198	Kilos.
Corn	do	2,762	134	203,175	Liters.
La Laguna:					
Rice	Fair	2,647	4,825	7,039,670	Do.
Abacá	do	51	513	950,094	Kilos.
Copra	do			5,435,941	Do.
Sugar cane	do	316	653	918,231	Do.
La Union:					
Rice	Good		229	499,500	Liters.
Maguey	do	106	119	29,086	Kilos.
Copra	do			374,360	Do.
Sugar cane	do	485	3,103	1,280,524	Do.
Tobacco	Fair	3,423	2,022	1,851,194	Do.
Leyte:					
Rice	Good	6,798	6,055	7,321,900	Liters.
Abacá	do	2,301	26,205	10,247,161	Kilos.
Copra	do			1,981,678	Do.
Corn	Fair	2,667	1,159	2,800,984	Liters.
Mindoro:					
Abacá	Good	23	211	158,109	Kilos.
Copra	Fair			79,062	Do.
Corn	Good	122	20	24,450	Liters.
Misamis:					
Rice	Fair	235	1,710	914,315	Do.
Abacá	do	31	3,037	799,599	Kilos.
Copra	do			339,397	Do.
Corn	do	141	276	116,490	Liters.
Moro:					
Rice	Good	899	1,688	3,150,000	Do.
Abacá	do	460	2,405	1,366,858	Kilos.
Copra	do			229,479	Do.
Corn	Fair	47	197	200,795	Liters.
Mountain:					
Rice	Good	5,195	898	1,473,700	Do.
Tobacco	Fair	49	48	5,864	Kilos.
Corn	do	117	161	34,875	Liters.
Nueva Ecija:					
Rice	Good		26,448	38,813,800	Do.
Copra	do			254,400	Kilos.
Sugar cane	do	311	233	300,420	Do.
Tobacco	do	521	170	170,598	Do.
Corn	do	59	216	121,000	Liters.
Nueva Vizcaya:					
Rice	Fair	1,712	2,492	2,262,250	Do.
Sugar cane	Good	37			
Tobacco	do	51			

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		Hectares.	*Hectares.*		
Occidental Negros:					
Rice	Fair		8,365	15,328,775	Liters.
Abacá	do	59	1,385	446,885	Kilos.
Copra	do			2,788,981	Do.
Sugar cane	Good	14,598	16,715	335,477,110	Do.
Tobacco	Fair	36	326	91,100	Do.
Oriental Negros:					
Rice	Good	272	863	520,000	Liters.
Abacá	do	2,080	2,035	2,412,425	Kilos.
Copra	do			520,543	Do.
Sugar cane	Fair	841	1,052	2,611,450	Do.
Tobacco	do	91	4,240	472,320	Do
Corn	do	1,658	4,655	2,096,275	Liters.
Palawan:					
Copra	Good			64,125	Kilos.
Pampanga:					
Rice	Fair	5,079	13,747	16,893,950	Liters.
Sugar cane	do	16,562	15,010	34,154,630	Kilos.
Corn	do	733	888	172,695	Liters.
Pangasinan:					
Rice	Good	74	34,666	42,040,660	Do.
Maguey	do	2	74	19,572	Kilos.
Copra	Fair			194,111	Do.
Sugar cane	Good	2,197	1,327	6,626,404	Do.
Tobacco	do	7,395	5,129	717,018	Do.
Corn	Fair	1,065	864	410,348	Liters.
Rizal:					
Rice	do	660	1,700	1,208,725	Do.
Sugar cane	do	1,552	765	831,574	Kilos.
Corn	do	64	28	12,450	Liters.
Samar:					
Rice	do	4,171	969	663,612	Do.
Abacá	Good	2,841	4,438	2,089,846	Kilos.
Copra	Fair			333,045	Do.
Sugar cane	do	135	219	113,380	Do.
Corn	Good	149	196	62,850	Liters.
Sorsogon:					
Rice	Fair	8,561	1,543	1,335,333	Do.
Abacá	Good	4,747	24,571	12,258,458	Kilos.
Copra	do			441,990	Do.
Sugar cane	do	93	138	74,825	Do.
Corn	do	229	455	190,460	Liters.
Surigao:					
Rice	Good	5,693	392	149,200	Do.
Abacá	do	507	1,905	1,034,777	Kilos.
Copra	do			89,101	Do.
Tarlac:					
Rice	do	620	15,112	20,723,390	Liters.
Sugar cane	Fair	3,564	3,995	3,218,596	Kilos.
Tobacco	do	123	59	12,636	Do.
Corn	do	496	165	67,875	Liters.
Tayabas:					
Rice	Good	2,414	1,525	1,081,150	Do.
Abacá	do	408	651	209,184	Kilos.
Copra	do			2,447,126	Do.
Corn	do	161	105	73,125	Liters.
Zambales:					
Rice	Fair		6,585	7,060,345	Do.
Copra	do			42,014	Kilos.
Sugar cane	do	106	58	56,425	Do.
Corn	do	128			

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abacá, copra, sugar, tobacco, and corn for the quarter ending March 31 and months of April and May, 1910.

QUARTER ENDING MARCH 31.

[NOTE.—75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal.]

Province.	Unhulled rice per 75 liters.		Abacá per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱3.75	₱2.00	₱9.35	₱6.30	₱10.50	₱8.85					₱3.50	₱1.50
Albay	3.50	2.00	13.00	6.40	10.00	5.50					4.00	1.50
Ambos Camarines	4.50	1.50	10.00	5.00	12.50	5.00	₱8.00	₱6.00			5.00	1.50
Antique	3.12	1.75	15.00	8.00	9.00	6.00	8.00	4.00	₱22.50	₱15.00	2.50	1.00
Bataan	3.00	2.00					8.00	5.00			4.00	2.00
Batangas	4.25	2.00	12.00	8.00			9.00	4.00	15.00	6.00	5.00	2.00
Bohol	3.75	1.00	15.00	5.00	12.00	7.00	8.00	4.00	20.00	4.00	5.00	2.50
Bulacan	2.75	1.75					9.50	6.00	18.00	8.00	3.60	1.50
Cagayan	4.00	2.00							20.00	8.00	5.00	1.00
Capiz	3.75	1.50	16.00	6.00	10.00	6.00	8.00	5.00	20.00	6.00	3.00	1.00
Cavite	3.75	2.30	17.00	14.00			9.40	5.25			3.75	1.25
Cebu	4.00	2.50	15.20	8.00	12.00	6.00	8.00	5.00	20.00	4.00	5.00	2.25
Ilocos Norte	4.00	2.00					8.00	3.00	20.00	4.00	3.00	2.50
Ilocos Sur	4.50	2.00			10.00	5.00	8.00	3.00	25.00	4.00	5.00	1.50
Iloilo	3.50	1.25	18.50	12.00	12.00	6.50	9.50	6.00	23.00	5.53	3.25	1.20
Isabela	5.00	3.12							20.40	10.00	5.00	2.50
La Laguna	3.50	2.00	12.00	6.95	9.00	6.00	9.00	5.00			4.00	2.00
La Union	5.00	1.50			8.00	6.00	7.50	3.00	9.50	4.00	4.50	2.00
Leyte	4.00	2.00	13.75	8.22	10.50	4.00	9.71	4.00	25.00	4.50	4.00	1.50
Mindoro	3.75	1.75	13.00	9.00					30.00	12.00	3.12	1.50
Misamis	3.50	2.00	12.50	6.75	11.70	8.82	8.00	5.50	25.00	5.00	3.50	2.00
Moro	2.50	1.80	15.00	8.25	10.00	6.50	5.00	4.00	30.00	27.00	3.50	2.00
Mountain	8.00	2.00			8.00	3.00	6.25	3.00	10.00	3.00	6.25	2.00
Nueva Ecija	3.00	1.25					9.00	4.00	23.00	7.50	4.00	1.25
Nueva Vizcaya	5.00	2.00							21.50	11.00	4.00	1.75
Occidental Negros	3.00	2.00	16.00	10.00	11.50	6.00	9.00	5.50	25.00	5.00	3.50	1.50
Oriental Negros	4.12	2.50	12.50	7.70	12.30	7.00	9.00	4.00	20.00	6.50	5.00	2.50
Palawan	3.00	2.50			7.50	6.00					1.50	1.50
Pampanga	2.50	2.00					9.00	6.00			3.75	1.50

Pangasinan	4.00	1.00	----------	----------	10.00	4.00	9.00	5.00	20.00	6.00	4.00	1.50
Rizal	2.75	2.00	----------	----------	----------	----------	9.52	6.00	----------	----------	3.50	1.00
Samar	3.75	1.50	14.50	8.00	9.50	5.00	----------	----------	25.00	6.00	5.00	2.00
Sorsogon	3.75	2.25	11.25	6.30	10.50	5.50	8.00	5.00	12.00	3.00	5.00	1.50
Surigao	3.50	2.00	12.65	8.50	11.00	6.93	9.25	5.00	----------	----------	2.50	1.50
Tarlac	3.75	1.50	----------	----------	----------	----------	8.00	6.00	12.00	9.00	2.50	2.00
Tayabas	5.00	2.25	16.00	5.50	10.00	5.00	8.50	5.00	15.00	6.00	5.00	2.50
Zambales	3.25	1.50	----------	----------	10.00	5.00	9.00	4.00	20.00	4.00	5.00	1.50

APRIL.

Agusan	₱3.75	₱2.50	₱10.00	₱7.25	₱12.00	₱7.50	----------	----------	----------	----------	₱3.00	₱2.00
Albay	3.50	2.25	15.00	7.56	10.00	6.33	----------	----------	----------	----------	4.00	1.50
Ambos Camarines	4.00	2.00	13.00	6.00	12.00	5.50	₱8.00	₱4.00	----------	----------	4.00	2.50
Antique	3.12	1.50	----------	----------	10.00	6.00	8.00	6.00	₱22.50	₱6.00	2.50	1.50
Bataan	3.50	2.00	----------	----------	----------	----------	8.00	6.00	----------	----------	4.00	4.00
Batangas	3.50	2.40	12.00	10.00	----------	----------	9.00	5.00	12.00	6.00	5.00	2.50
Bohol	3.50	1.50	15.00	8.00	13.00	8.00	8.00	4.00	20.00	5.00	5.00	2.50
Bulacan	2.65	1.35	----------	----------	----------	----------	8.50	7.25	18.00	8.50	3.50	2.00
Cagayan	4.00	1.75	----------	----------	----------	----------	----------	----------	30.00	8.00	5.00	2.50
Capiz	3.75	1.30	16.00	7.00	11.00	6.00	8.00	6.00	30.00	8.00	2.50	1.25
Cavite	3.00	2.10	----------	----------	----------	----------	9.40	5.25	----------	----------	3.00	2.50
Cebu	5.00	3.00	15.50	9.50	12.00	6.00	8.50	5.00	20.00	4.00	5.00	3.00
Ilocos Norte	3.00	2.00	----------	----------	----------	----------	8.00	4.00	15.00	3.00	3.00	1.00
Ilocos Sur	4.75	2.20	----------	----------	9.00	5.00	7.00	4.00	25.00	4.50	5.00	1.00
Iloilo	3.40	1.75	14.00	12.00	12.00	7.50	9.25	6.00	25.00	3.50	3.00	1.20
Isabela	5.00	4.50	----------	----------	----------	----------	----------	----------	30.00	7.20	5.00	3.00
La Laguna	3.50	2.00	12.00	6.50	9.00	6.32	8.20	5.00	----------	----------	4.00	2.50
La Union	2.80	1.50	----------	----------	8.00	5.00	6.60	4.00	9.00	5.00	4.50	2.00
Leyte	3.50	2.00	13.75	7.75	11.00	5.00	9.00	5.00	25.00	5.00	4.50	2.00
Mindoro	4.00	2.00	15.00	9.00	----------	----------	----------	----------	30.00	10.00	3.50	2.50
Misamis	3.50	2.00	12.00	7.00	12.00	8.00	8.50	7.00	25.00	5.00	4.50	2.00
Moro	3.00	2.00	15.50	8.85	11.50	8.00	7.00	4.00	30.00	27.00	3.50	2.00
Mountain	7.50	2.50	----------	----------	6.00	5.00	6.25	4.00	10.00	2.50	4.00	1.00
Nueva Ecija	2.77	1.25	----------	----------	----------	----------	9.00	6.00	23.00	5.00	5.00	1.25
Nueva Vizcaya	5.00	3.12	----------	----------	----------	----------	----------	----------	21.50	11.00	3.00	2.50
Occidental Negros	3.12	2.25	16.00	10.00	12.00	6.00	8.75	7.00	25.00	6.00	3.50	2.00
Oriental Negros	4.00	2.50	13.00	7.60	12.00	7.50	8.50	6.50	20.00	5.00	5.00	3.50
Palawan	3.12	3.00	----------	----------	8.00	5.50	----------	----------	----------	----------	2.00	2.00
Pampanga	3.00	2.00	----------	----------	----------	----------	8.00	6.90	----------	----------	2.50	1.75
Pangasinan	4.50	1.50	----------	----------	9.00	5.00	8.00	5.00	20.00	5.00	4.00	1.50
Rizal	3.00	2.25	----------	----------	----------	----------	9.00	7.00	----------	----------	2.80	2.00
Samar	3.00	1.25	14.00	8.86	9.00	6.90	----------	----------	30.00	6.00	4.00	2.50
Sorsogon	3.75	2.00	11.50	7.50	10.12	5.50	8.00	6.00	30.00	6.00	4.00	1.50
Surigao	3.00	1.50	12.50	7.25	10.00	7.50	----------	----------	----------	----------	3.00	2.00
Tarlac	3.20	1.75	----------	----------	----------	----------	8.00	4.00	12.00	9.00	2.50	2.10
Tayabas	3.00	1.00	15.00	5.75	8.50	5.50	9.00	7.50	15.00	6.00	5.00	2.50
Zambales	2.50	1.90	----------	----------	10.00	7.00	9.00	4.00	18.40	6.00	4.00	2.00

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS—Continued.

Highest and lowest prices of unhulled rice, abacá, copra, sugar, tobacco, and corn, quarter ending March 31, etc.—Continued.

MAY.

Province.	Unhulled rice per 75 liters.		Abacá per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱4.75	₱2.50	₱10.00	₱7.25	₱12.00	₱7.50					₱2.50	₱2.00
Albay	3.50	2.20	14.50	6.95	11.00	6.33					4.00	1.50
Ambos Camarines	3.75	2.20	11.00	6.50	12.50	6.00	₱8.00	₱6.00			4.00	2.50
Antique	3.12	2.00			10.00	6.00	8.00	6.00	₱22.50	₱6.00	2.50	1.00
Bataan	3.50	2.00					8.00	6.00			4.00	3.50
Batangas	3.50	2.40	13.50	10.00			9.00	4.50	12.00	6.00	5.50	2.50
Bohol	3.75	2.20	14.00	8.25	13.00	7.50	8.00	4.00	23.00	4.58	5.00	2.50
Bulacan	3.00	2.30					8.00	7.00	18.00	8.50	3.50	2.50
Cagayan	4.00	2.25							30.00	6.00	4.75	2.25
Capiz	3.75	1.10	16.00	10.00	10.50	5.00	8.00	7.00	30.00	8.00	2.50	1.00
Cavite	3.00	2.25					9.40	5.25			3.00	2.50
Cebu	5.00	3.00	15.50	9.00	11.50	8.00	9.50	5.00	20.00	4.00	5.00	3.00
Ilocos Norte	3.00	2.00					8.00	4.00	15.00	3.00	3.00	1.00
Ilocos Sur	4.75	2.20			9.00	5.00	7.00	4.00	26.00	4.50	5.00	1.00
Iloilo	3.40	1.75	14.00	12.00	12.00	7.50	9.00	6.00	25.00	3.50	3.00	1.20
Isabela	5.00	4.50							30.00	7.20	5.00	3.00
La Laguna	3.50	2.40	12.00	6.30	9.00	6.00	8.00	6.00			4.00	2.50
La Union	3.00	2.00			8.00	6.00	6.60	4.00	9.00	7.00	4.50	2.10
Leyte	3.50	2.00	14.00	7.50	12.00	5.50	7.00	4.00	25.00	5.00	4.50	2.00
Mindoro	4.00	2.50	12.65	9.00					30.00	10.00	4.00	2.00
Misamis	4.00	2.50	10.00	7.00	11.00	8.19	9.50	7.00	25.00	5.00	4.50	2.00
Moro	2.50	2.00	15.50	8.85	11.12	8.00	7.00	4.00	30.00	27.00	3.50	2.00
Mountain	7.50	2.50			6.00	5.00	6.25	4.00	10.00	2.50	4.00	1.00
Nueva Ecija	2.77	1.25					9.00	6.00	23.00	6.00	5.00	1.25
Nueva Vizcaya	5.25	3.12							21.50	11.00	3.00	2.50
Occidental Negros	3.12	2.25	16.00	10.00	12.00	6.00	8.75	6.50	25.00	6.00	3.80	2.00
Oriental Negros	4.00	2.50	13.00	7.60	12.00	7.50	8.50	6.75	20.00	5.50	5.00	3.80
Palawan	4.00	3.00			8.50	6.00					2.00	2.00
Pampanga	3.00	2.05					8.00	6.50			3.00	1.75
Pangasinan	4.50	1.50			9.00	5.00	8.00	5.00	20.00	6.50	4.00	1.50
Rizal	3.00	2.40					9.50	7.00			2.50	2.00
Samar	3.25	1.25	14.00	8.00	9.00	6.00			25.00	6.00	4.00	2.50
Sorsogon	3.50	2.00	11.00	4.00	10.00	5.50	8.00	8.00	30.00	6.00	4.00	1.50
Surigao	3.00	1.50	12.70	7.25	8.00	7.50					2.50	2.00
Tarlac	3.80	2.00					8.50	4.00	12.00	9.00	2.50	2.00
Tayabas	3.00	1.00	15.50	5.50	9.00	6.00	9.00	7.50	15.00	6.00	5.00	2.50
Zambales	2.50	2.00			10.00	7.00	9.40	4.00	18.00	6.00	4.00	3.00

CURRENT PERIODICAL LITERATURE.

ARTICLES IN CURRENT PERIODICALS, ETC., THAT MAY BE OF INTEREST TO AGRICULTURISTS IN THE PHILIPPINES.

Recent Work on Diseases of Coconut Palms. *The Agricultural News,* Volume IX, No. 216, August 6, 1910. An account of bud-rot, root disease, and stem-bleeding disease, and suggested methods for their control. Rather brief.

Selection of Cocoa-nuts for Planting. Extracts from an article published in *L'Agriculture Pratique des Pays Chauds,* May, 1910. *The Agricultural News,* Volume IX, No. 216, August 6, 1910. Specific directions for choosing the proper seed nuts for planting.

Electricity for Sugar Mills, by Percival Robert Moses. *Louisiana Planter,* Volume XLV, No. 8, August 20, 1910. A sketch of the processes carried on in milling sugar, and a detailed account of the advantages to be derived from the use of electricity for power.

The Cross-fertilization of Coffee, by Rudolph Anstead, in an address before the Nilgiri Planters' Association. *Tropical Life,* Volume VI, No. 7, July, 1910. A plan for substituting, by means of cross-fertilization, sickly and infested trees by vigorous and disease-resisting hybrids. Brief.

Soil Waste in the Canefield. *Queensland Agricultural Journal,* Volume 25, part 3, September, 1910. Some general suggestions to sugar-cane planters, grouped under the subjects Drainage Wastes, The Checks upon Wastes, and Needs of Cane Soils.

Indigenous Rubber News. *Tropical Life,* Volume VI, No. 8, August, 1910. Information gathered from consular reports regarding the condition and prospects of the indigenous rubber interests in South America, etc.

La Culture Commerciale du Bananier á la Jamaique, par M. O. Labroy. *Journal d'Agriculture Tropicale,* No. 109, Juillet, 1910. The importance of the banana trade in 1908–9, and the methods employed in cultivating bananas in Jamaica and Surinam, with other information regarding the industry in general.

Cotton. Methods of Determining Best Varieties to Grow.

By W. H. Scherfius. *Transvaal Agricultural Journal,* Volume VIII, No. 32, July, 1910. A lecture delivered to the students of the school of agriculture, Potchefstroom Experimental Farm.

The Soy-Beam (*Glycine hispida*), by Joseph Brutt-Davy, F. L. S. Government Botanist and Agrostologist. *Transvaal Agricultural Journal,* Volume VIII, No. 32, July, 1910. Description, varieties, cultivation, and uses, giving an account of experiments conducted in the Transvaal.

Die-back Diseases of Hevea, Cacao and Mango. *Agricultural News,* Volume IX, No. 217, August 20, 1910. Characteristics and suggested remedies for die-back in hevea, cacao, and mangoes. Brief.

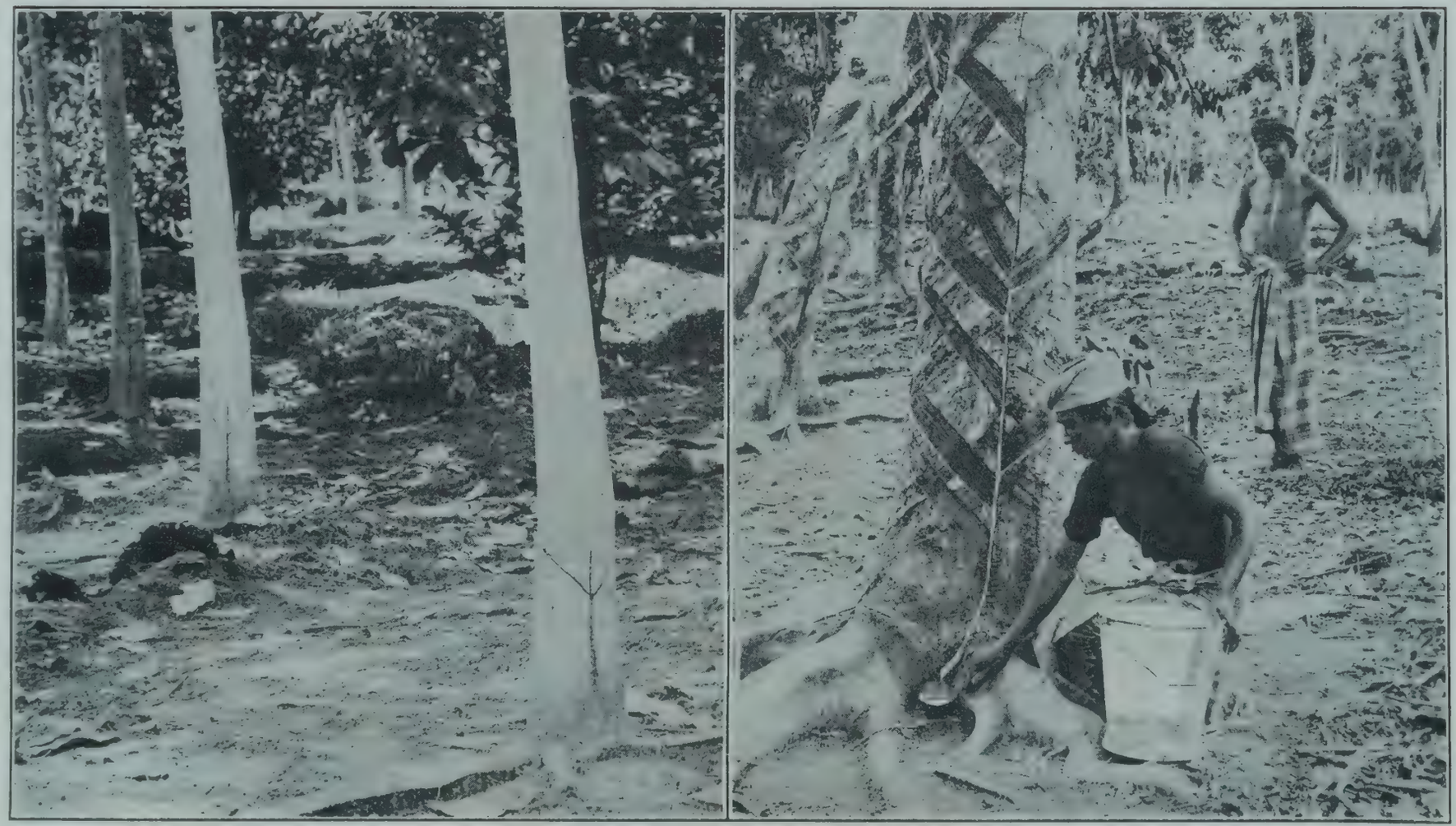
Les Facteurs Essentiels de l'Acclimatement du Bétail Européen dans les pays chauds. Rapport introductif, presenté au ler Congrés Internacional d'Agronomie Tropicale. Par M. C. Vétérinaire de regiment Meulemau, de l'Armée belge. In *L'Agronomie Tropicale,* 2me Année, No. 6, Juin, 1910.

Changes in the Soil and its Fertility. Copied from *The West India Agricultural News* (no date), in *The Louisiana Planter,* Volume XLV, No. 6, August 6, 1910. A discussion of the various factors in the fertility of the soil and means for supplying these.

Utilization des résidus de la défibration des Agaves pour la production de l'alcool. Par M. F. H. d'Hérelle. *Journal d'Agriculture Tropicale,* Année X, No. 108, Juin 30, 1910. The possibilities of agave fiber plants as sources of alcohol, methods of extracting it, and results obtained.

Paper-Making Fibre, etc., by A. D. Little. From *The Paper Trade Review,* Volume 53, No. 11, March, 1910. *The Tropical Agriculturist,* Volume 35, No. 2, August, 1910. A discussion of the possibilities of bamboo, bagasse, and lalang grass as paper-making materials and tests to be applied to fibrous materials in general.

Malay Camphor, by A. Sanger Davies. *Agricultural Bulletin of the Straits and Federated Malay States,* Volume IX, No. 8, August, 1910. Description, distribution, culture, and products of *Dryobalanops camphora.* Brief.



(*a*) (*b*)

PLATE I.—(*a*) YOUNG PARA RUBBER TREES, FIRST TAPPING IN MALAYA. (*b*) OLD PARA RUBBER TREES IN MALAYA, SHOWING SUCCESSIVE TAPPING SCARS OVER SAME AREA.

THE PHILIPPINE

Agricultural Review

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EDITORIAL.

WALKER ON SUGAR IN NEGROS.

The Sugar Industry in the Island of Occidental Negros, by Herbert S. Walker, is the title of a very valuable publication recently issued by the Bureau of Science.

This is the first comprehensive treatise on sugar gotten out in the Philippine Islands since the American occupation, and is the best piece of literature on that subject now to be had. It represents almost two years' work, done by Mr. Walker in Negros with a portable laboratory, at the sugar chemical laboratory at Iloilo, and at the Bureau of Science in Manila working up materials collected. It is divided into a number of sections dealing with several phases of the sugar industry.

The first of these is devoted to general information regarding Negros, and takes up questions of geology, climate, divisions by natural contour, and water courses, and goes briefly into the history, development, and present status of the sugar industry in Negros.

The second section deals more particularly with the sugar-producing districts and shows their comparative merits. This chapter is brimful of technical information. It shows the location and area of the sugar sections, the area in cultivation, possibilities for the extension of the industry, rainfall, chemical and physical analysis of soils, and gives suggestions for their improvement by better cultivation, drainage, and the use of fertilizers.

The third section is devoted to the soils of Negros and their comparison with those of other sugar-producing countries. This is very interesting as it shows conclusively that "the soil of Negros may rightfully be classed as among the better of the sugar lands of the world."

The fourth section is devoted to a careful study of the cane produced in Negros, and goes extensively into the question of varieties, their characteristics, and composition in different parts of the island. Mr. Walker reaches the conclusion that the common native purple cane is better suited to the needs of the sugar growers of Negros than any other variety which he studied. He found the percentage of fibre in this cane to be lower, and the percentage of sugar to be higher, than in most varieties grown in different countries of the world.

The fifth section is devoted to a description of the present methods of sugar growing as practiced in Negros. It goes into

a discussion of the way in which labor is employed, its cost, efficiency, and the resulting cost for the production of sugar cane delivered at the mill.

The sixth section is devoted to the manufacture of sugar according to the antiquated equipment and methods now used in Negros. There is not a large, modern mill or a single piece of vacuum apparatus in the island. The different types of mills are described and classified, the results from mill controls given, and the classes of sugar produced are discussed from the standpoint of cost, value, and selling price.

The seventh section is devoted to possibilities for improvement, both in the cultivation and the manufacture of sugar.

It is well illustrated with half-tones printed on enamel paper which show many interesting features of the sugar industry in Negros.

The REVIEW most heartily commends this publication to all who are seeking information on the sugar industry in the Philippine Islands. It is paper bound, contains 145 pages, 10 plates, and sells for ₱2.50 ($1.25 United States currency). Orders should be addressed to the Business Manager, Philippine Journal of Science, Manila. Remittance by money order is preferred. In writing mention Bureau of Science Order No. 412.

CONSUMPTION OF SUGAR IN AMERICA.

The population of the United States is 90,000,000 and each person consumes on an average of 82 pounds (37.3 kilos) of sugar per annum. This amounts to 3,750,000 tons per annum and costs the American people ₱750,000,000. The sources from which this sugar are derived are as follows:

American grown.	Kind.	Tons of 2,000 pounds.	Value at 5 cents United States currency per pound.
Western States	Beet	512,500	$51,250,000
Southern States	Cane	375,000	37,500,000
Territory of Hawaii	do	555,500	55,500,000
Porto Rico	do	284,500	28,450,000
Philippines	do	88,000	8,800,000
Total		1,815,500	181,550,000
Cuba (20 per cent off duty)		1,500,000	150,000,000
Other countries (paying full duty)		434,500	43,450,000
Total		1,934,500	193,450,000

During the past sugar season in the Philippines heavy purchases were made for shipment to America. This had the effect of running the price very high and made sugar much more profitable here than in former years. However, the total amount which could be found in the Philippine markets suitable for exportation to America, or which could not be more profitably sent to China, was only 88,000 tons, or a little more than one-fourth of the amount that is admitted free of duty into the United States.

It is interesting to note that the export value of this sugar was only ₱15,080,000 while the total value of the 300,000 tons admitted free to the United States would have been ₱51,408,000.

It is also interesting to note that the amount of sugar imported into the United States from Cuba and from countries which pay the full duty, is now only a little more than 50 per cent of the total sugar consumed, whereas in former years this has run as high as 75 per cent.

There is evidently considerable interest taken in America in the sugar business of the Philippines, as is attested by reference to it in the statistical publications of the Government and in the sugar and trades journals. The Louisiana Planter for December 16, 1909, published an address before the Louisiana Sugar Planter's Association by G. E. Nesom, Director of Agriculture for the Philippines. In the number for September 17, 1910, they reproduced from The PHILIPPINE AGRICULTURAL REVIEW a two-column article on sugar by the editor, and in the number for September 24, 1910, they published in full "The Philippine Sugar Industry," by Mr. Harold M. Pitt, as it appeared in the Manila Times. A number of references to this subject have appeared in their editorial columns and there is a notable absence of the adverse criticisms of former years. The Philippines have suffered more from lack of attention than from any other cause and if present indications are any criterion it appears that they are gradually assuming a place in a more favorable light before the American people.

THE OUTLOOK FOR THE RICE CROP.

It is too early to state with accuracy from reports at hand the probable shortage of the rice crop this year over last, for the reason that much depends upon the weather for the next two months. In many places where there was a delay in planting because of early drought, late rains have made it possible to plant nearly as much as would ordinarily have been planted

earlier, and if favorable weather conditions prevail from now on a fair crop will be harvested.

The monthly reports from agricultural inspectors for both September and October, as well as the narrative reports of Constabulary inspectors lately received, show that owing to drought considerable land usually devoted to rice has not been planted, and that growing rice has suffered considerably from the same cause. A comparison of area under cultivation to rice given in quarterly reports for the quarter ending September 30, 1910, with those for the same period in 1909 shows little falling off in the amount planted in Luzon, many municipalities showing a decided increase. How much of this growing crop will be damaged will be largely determined, as stated above, by future weather conditions. Tarlac, it is reported, has suffered considerably already.

From all available data it does not seem probable that the general falling off will amount to over 25 per cent, and with favorable conditions may not exceed 10 or 15 per cent.

THE RUBBER CAMPAIGN.

We are publishing in this number a report by Mr. A. W. Prautch on his visit to the Agri-Horticultural Show at Singapore, August 17 to 20, 1910. Mr. Prautch went as a joint representative of the Bureau of Agriculture, representing the Philippine Government, and of the Manila Merchants' Association, representing the commercial interests of these Islands. His report is brief but shows clearly the great good that may be accomplished by establishing closer relations with our neighbors of adjacent British colonies, who have made greater progress in rubber growing than any other people in the Orient.

A great deal of enthusiasm has been created through a little publicity campaign conducted by Mr. Prautch with the American and Spanish-Filipino press. The PHILIPPINE AGRICULTURAL REVIEW has devoted a great deal of space to articles on rubber during the past two years, the Manila Times has recently gotten out a special supplement on rubber, the Cablenews-American and Bulletin have run several articles and editorials on the subject, and other papers have given it equally prominent attention. In their enthusiasm some of these papers have even gone so far as to adversely criticize the Bureau of Agriculture for not having established rubber plantations in the Philippines. They do not distinguish between a public-service office and a commercial enter-

prise. It would be quite out of the question for the Bureau of Agriculture to maintain large rubber plantations, rice fields, sugar farms, and the many other things which would be demanded if this policy were put into force.

This Bureau has a lot of fine Pará rubber trees growing in Manila, already at the bearing age and topped. The distribution of Pará seed in the ordinary way is out of the question as they must be imported and have very poor keeping qualities. The seed imported have been germinated and the young trees distributed. These will in time become central seed supplies wherever growing.

It is hoped that the enthusiasm now being shown in rubber will continue and that private enterprise will soon establish a large number of plantations in these Islands where conditions unquestionably exist that will result in successful rubber production.

VETERINARY CONTROL WORK.

By Dr. G. E. NESOM, *Director of Agriculture.*

The situation with reference to animal diseases in the Philippine Islands is considerably worse than it was at the beginning of the current fiscal year. This is shown by the fact that on the 1st day of July the number of towns infected with rinderpest in the Islands was twenty-five and up to October 10 this had increased to fifty. As this number of the REVIEW goes to press reports show that it has again decreased to forty-six. There are two distinct sections of the infected territory. One is limited largely to a group of coast towns in the Visayan Islands, located principally on Leyte, Cebu, and Negros, while the other includes the principal towns located along the line of the Manila Railway Company between Manila and Dagupan. In both instances the disease has spread largely by the movement of animals in the regular channels of trade.

All existing laws, executive orders, and regulations seem to be inefficient in stopping the movements of infected animals, and the rapid spread of the disease just at the close of the rainy season has caused considerable fear of another serious general outbreak.

In order to ascertain whether or not there was anything which might be done to prevent the further spread of rinderpest and other diseases, His Excellency the Governor-General has issued the following executive order:

[Executive Order No. 63.]

NOVEMBER 9, 1910.

Dr. George E. Nesom, Col. H. B. McCoy, and Mr. J. S. Reis are hereby appointed a committee of three to consider the question of the transportation of live stock by land and water from point to point in the Philippine Islands, and to determine the size and type of boat which should be allowed to transport live stock by water, and the rules and regulations necessary to protect the animals against suffering for lack of food or water and against infection by disease in transit, whether in boats or in cars.

The committee will make a study of the existing laws and regulations and will make recommendation in regard to additional regulations and cause to be prepared such legislation as it may deem necessary to carry out the recommendation.

W. CAMERON FORBES,
Governor-General.

The committee was called together immediately by the chairman, and after due deliberation it was decided that the desired end could be accomplished, at least in part, by prohibiting vessels of less than 15 tons burden, which are not subject to customs inspection, from carrying horses, cattle, and carabaos, requiring that those vessels which accept live stock as cargo shall be regularly disinfected before taking on stock for shipment, and that no vessel be allowed to accept animals for shipment from a port declared by the Director of Agriculture to be infected with a dangerous communicable disease, except when accompanied by a certificate issued by authority of the Director of Agriculture showing them to be free from disease.

The Collector of Customs has issued, under existing law, the following administrative circular regulating shipments by sea:

[Customs Administrative Circular No. 622.]

Publishing regulations covering transportation of live stock by vessels engaged in coastwise trade.

NOVEMBER 14, 1910.

To all collectors of customs and others concerned:

PARAGRAPH I. The Director of Agriculture having certified to this Office that rinderpest is prevalent in certain districts in the Philippine Islands, the following regulations are hereby published covering transportation from place to place by vessels engaged in the coastwise trade:

PAR. II. No live stock shall be carried in the coastwise trade by vessels under 15 tons gross burden, except hogs, sheep, goats, and other similar live animals.

PAR. III. Before any live stock is received for shipment by a vessel regularly licensed for the coastwise trade, or by a vessel operating without a license, the master, mate or *patron* in command of such vessel shall require the person offering said live stock for shipment to present to him a certificate signed by the president, secretary, or *teniente* of barrio of the municipality from which shipment is made. Such certificate shall contain a description of each animal to be shipped, shall specify the kind of animals, brands, if any, point of origin, and point of destination, and shall show that such animals are, to the best knowledge and belief of the officer signing the certificate, free from infectuous or dangerous communicable animal diseases.

PAR. IV. In case the carrying vessel is clearing from Manila, Iloilo, Cebu, Zamboanga, Jolo, or Balabac, all of which are ports of entry, the certificate above set out shall be executed by the Director of Agriculture,

or his duly authorized agent, and shall be presented by the master to the collector of customs along with his manifest for the clearance of the vessel.

PAR. V. Upon receipt of a consignment of animals for shipment, accompanied by the above-specified certificate, the master of the carrying vessel shall carry them to the port of destination specified in the certificate. Upon arrival at the port of destination, the master of the carrying vessel shall deliver, or cause to be delivered, the certificate to the municipal president and shall refuse to permit the discharge of said cattle at any other port unless said certificate is returned to him indorsed by one of the municipal officers specified in Paragraph III of this circular, of the port named therein, authorizing delivery at some other point. Upon discharging said cattle from the carrying vessel, the municipal president shall take up said certificate, indorse thereon point of delivery and date of discharge, and forward same to the nearest collector of customs, who in turn will forward it direct to the Director of Agriculture.

PAR. VI. Whenever the Director of Agriculture shall declare any particular port or place within the Philippine Islands to be infected with dangerous communicable animal diseases, no live animal of any description shall be transported from such port or place by any vessel engaged in the coastwise trade, unless said animals are accompanied by a certificate signed by the Director of Agriculture, or by his duly authorized agent, permitting said animals to be transported to some specified port or place. (This certificate to be in lieu of the certificate provided in Paragraph III hereof.)

PAR. VII. Any vessel violating any of the provisions of the foregoing regulations, shall be subject to a fine of not more than ₱200 Philippine currency, and, in addition thereto, the license of any such vessel may be revoked. The license of any officer violating any of the above-specified regulations shall be liable to suspension or revocation, as the facts may justify.

PAR. VIII. Philippine customs officers shall give due publicity to the terms of this circular.

H. B. MCCOY,
Insular Collector of Customs.

Approved.
GREGORIO ARANETA, *Secretary of Finance and Justice.*

The Director of Agriculture had previously issued the following general order dealing with the subject of the cleaning and disinfecting of vessels and railway cars:

[General Order No. 17.]

Disinfection of boats and railway cars.

MANILA, P. I., *November 8, 1910.*

Notice is hereby given that owing to the prevalence of dangerous communicable (contagious) animal diseases throughout the Philippine Islands, all boats and railway cars used to transport animals are deemed to be infected with the micro-organisms of said diseases in accordance with the provisions of Paragraph (*e*), section 6, Act No. 1760, Acts of the Philippine Commission.

1. All such boats and railway cars are hereby required to be cleaned and disinfected immediately after the unloading of each and every shipment of animals. Said cleaning and disinfection shall be performed in the following manner and in the presence of a representative of the Director of Agriculture:

(*a*) Remove all litter and manure. This litter and manure shall be disinfected with a 5 per cent solution of carbolic acid, creolin, or Jeyes' fluid, or any other reliable disinfectant approved by the Director of Agriculture; and if not disinfected, it shall be burned, or buried 1 meter below the surface of the ground.

(*b*) Saturate the sides and floors of railway car and all parts of the boat contaminated by cattle, with a 5 per cent solution of one of the above-mentioned disinfectants, or disinfect with a jet of steam under pressure of not less than 50 pounds to the square inch.

2. The provisions of this general order shall become effective on and after November 15, 1910.

Approved.

NEWTON W. GILBERT, *Secretary of Public Instruction.*

Most of the vessels which will now be permitted to carry horses, cattle, and carabaos will be disinfected in Manila, Iloilo, and Cebu. Veterinarians are stationed at many other ports and places throughout the Islands and will supervise the cleaning and disinfection of vessels. Should the trade demand it special inspectors will be named at places where there are no employees of the Bureau of Agriculture. Arrangements have been made to inspect, clean, and disinfect railway cars at central points along the lines.

THE SEVENTH ANNUAL EXHIBITION OF THE AGRI-HORTICULTURAL SHOW AT SINGAPORE, AUGUST 17 TO 20, 1910.[1]

By Mr. A. W. Prautch.

In accordance with instructions I embarked on the steamer *Isla de Panay* on August 9, with five cases containing literature and exhibits, and reached Singapore August 14.

The committee of the Agri-Horticultural Show allotted a suitable location for the Philippine exhibits in which they were immediately arranged for display. On the night of the 16th the exhibit was ready for the opening on the 17th. Two Filipinos, who reside in Singapore, were employed and gave very valuable assistance in that they were familiar with the exhibits and were able to explain them to both the Malays and the Chinese; they also distributed literature to visitors, thus leaving me free to deal with the Europeans, talk with planters, and attend some of the demonstrations of the rubber machinery which was on exhibition.

His excellency the Governor, Sir John Anderson, and staff made a private inspection of the exhibits an hour before the gates were opened to the public. He was very cordial, and complimented the Philippines on their fine exhibit and the spirit that prompted us to come. He did the Philippines the honor of inviting their representative to a special tiffin, given to a few of the leading officials and officers of the exhibition, at the government house on Saturday, August 20. There I met those who by introductions made it possible for me to see the largest tapioca and rubber plantations at Malakka and Kuala Lumpur.

The fact that Consul-General James T. Dubois gave me his official and private indorsement and advice on all matters, contributed much to the complete success of the exhibit.

[1] Extracts from the report of Mr. A. W. Prautch, special delegate of the Manila Merchants' Association and the Bureau of Agriculture of the Philippine Islands. Mr. Prautch's complete report on methods of rubber culture in use in Malaya appeared in The Manila Times of November 9, 1910.

In the fiber class, the 20-foot abacá had only two badly cleaned maguey exhibits as competitors, and the 186 specimens of timber had no competing exhibits. This exhibit was in a class by itself and naturally attracted considerable attention. The committee granted the exhibit a silver medal.

I received nothing but kindness and courtesy from everyone; planters and officials alike were anxious to further my mission. The cordial expressions from all of friendship toward their Philippine neighbors and the United States made it clear to me that these were not for me personally but for the people of the Philippine Islands.

After the Exhibition closed, on August 20, I spent a few days packing and getting the material for my report into shape. I then sailed for Malakka, 118 miles north of Singapore, which is the center of the rubber and tapioca industries. I was cordially received and introduced by Mr. A. C. Baker, of the land office, who had been in charge of the Malakka exhibits at the Singapore show. Everything possible was done to make the week profitable and pleasant. The managers of three of the largest estates took me in their automobiles and gave me a day on each of their plantations, patiently answering my questions and allowing me to see everything of interest.

On September 2 I gave a lecture illustrated by 150 colored slides furnished by Dr. G. E. Nesom and the Bureau of Agriculture, which was a decided success; it was well attended by the leading officials, planters, ladies, and students of the college. A brief description of each picture, clear and concise, made the evening enjoyable as well as instructive.

Five hours by train took me to Kuala Lumpur, the capital of Selangor State; this district is almost wholly devoted to growing rubber. Here I secured several dozen photographs of different phases of the rubber industry and a 6-foot panoramic view of an estate 5 miles long and 1 mile wide. Two lectures had been arranged for me here in the Victoria Institution. Saturday night, September 3, was for the college students, and Monday night, September 4, for others; both lectures were largely attended. The use of a fine electric lantern was tendered me by Mr. B. E. Shaw, who kindly operated it himself; the pictures were made to appear like oil paintings.

A twelve-hour journey by train through rubber plantations or jungle took me back to Singapore. A large meeting was held in the Memorial Hall on Friday, September 9; every seat was taken and several hundred people were standing. The best people of Singapore attended. United States Consul-General

James T. Dubois opened the proceedings with a fifteen-minute speech on trade relations. The undivided attention showed that the audience was interested. I think the work of Mr. Dubois, the interest in the Philippines aroused by the exhibit, and the attention given to the subject by the Singapore press, account for the large attendance at the lecture.

On Tuesday, September 13, I left Singapore on board the U. S. naval auxiliary vessel *Abarenda* for Manila.

The following extract from an article, entitled "The Agricultural Show," in the Agricultural Bulletin of the Straits and Federated Malay States for October, 1910, may interest the readers of the REVIEW:

> In this shed was also staged a most instructive and interesting exhibit from the Philippines by Mr. Prautch. It included a very large series of Philippine timbers, Manila hemp, very fine and long, gutta-percha, locally made hats, and a remarkably fine sample of Caravonica cotton obtained at one gathering from a sample plant, a large series of very beautiful photographs, illustrating most of the cultivation and progress that our American friends have already made in opening up their tropical colonies. The whole collection was most attractive and was constantly surrounded by visitors eager to learn what was doing in that part of the East. A special medal was awarded to Mr. Prautch for this exhibit.

THE FORAGE BOARD AND ITS WORK.

By G. E. NESOM, *Director of Agriculture.*

The following order was issued by the honorable the Secretary of War just before his departure from Manila for the United States:

WAR DEPARTMENT,
Manila, P. I., September 1, 1910.

A board composed of the following officers of the Civil Government of the Philippine Islands and of the United States Army: Vice-Governor Newton W. Gilbert, president; Dr. G. E. Nesom, Director, Bureau of Agriculture; Col. Frederick G. Hodgson, assistant quartermaster-general; Lieut. Col. David L. Brainard, deputy commissary-general; Maj. Charles R. Krauthoff, commissary; Capt. William R. Smedberg, jr., Fourteenth Cavalry; Capt. Joseph L. Knowlton, quartermaster; Capt. John E. Stephens, Second Field Artillery; Capt. John J. Boniface, Second Cavalry; is hereby appointed to meet in Manila, at the call of the president, to investigate and report upon the present cost of forage for use of the Army in the Philippine Islands.

The board, after careful and exhaustive consideration, will report whether native forage can be substituted for that now used; and if so, to what extent; the advisability of using, in part, native grasses grown in the vicinity of the various posts with a view to reducing transportation; the relative cost of the two, and what methods, if any, should be adopted for procuring native forage, and, if deemed necessary, the board will conduct experiments for the purpose of ascertaining the utility and cost of production of native forage.

The board will also consider the question of using, wholly or in part, native beef for the supply of the Army in the Philippine Islands.

The Civil Governor and the Commanding General, Philippines Division, will extend to the board every proper and possible aid and facility to carry on its work.

The junior member will record the proceedings of the board, and separate reports as to forage and use of native beef will be rendered through the Commanding General, Philippines Division, to the Adjutant-General of the Army at the earliest practicable time consistent with thoroughness.

Such journeys within the Philippine Archipelago as the members of the board may deem essential to its work are, so far as they relate to the military members, necessary in the military service.

The Civil Government will bear cost of experiments and the travel expenses of its members under the laws and regulations governing in such cases.

J. M. DICKINSON, *Secretary of War.*

The first meeting of this board was held in Manila September 5, 1910, and was devoted to forming general plans for its work. At this meeting two special committees were appointed, one to consider the forage problem and the other the native-beef supply.

Capt. John J. Boniface, recorder of the board, assumed the duties of his office on arrival in Manila, September 14, 1910. He has since devoted his entire time to this work and has collected a large volume of information on the classes, kinds, condition, cost, and feeding value of all kinds of forage used in Manila.

At the second meeting of the board, held in Manila on October 25, he exhibited a large number of samples of forage and discussed them in an exhaustive report. At this meeting it was decided to conduct comparative feeding tests on army horses and mules with the more promising kinds of forage available. The American Army in the Philippines uses almost exclusively for saddle and draft purposes, the same classes of horses and mules that are used in the homeland, and they are fed largely on oats and timothy hay sent out from the Central and Western States. While both the live stock and the forage are quite satisfactory, in so far as general utility is concerned, the greatly increased cost resulting from the shipment of both half way around the world is being seriously felt by the War Department.

The idea of obtaining a local and more economic forage supply is not new, but has received the attention of both military and civil authorities ever since the American occupation of these Islands. It was first brought home to Army officers who had to go into the interior with their commands over roads that were at times impassable in many places for any animal or vehicle except a water buffalo (carabao) drawing a light bamboo mud sled. Under such circumstances the extensive transportation of imported forage to remote interior parts, or along with a moving army column, was next to impossible. The only alternative was to feed paddy, sheaf rice, green grass, corn and corn stover, supplemented by grazing. Although none of these are ordinarily considered a satisfactory forage for army horses, many officers in the hardest campaigns of 1899, 1900, and 1901 will testify that the horses kept in good condition and did their work as usual.

The first Director of Agriculture here was formerly an agrostologist in the United States Department of Agriculture, and devoted a large part of the year (1903) which he spent in the Philippines to the study of forage crops. His work benefited principally the Bureau of Agriculture, which still grows and uses some of the crops he introduced.

The second Director of Agriculture took another important step in advance, by advocating the curing of local forage by artificial heat and packing it into compressed bales for economy in handling and its better preservation by the exclusion of moisture. It was his work which finally resulted in the construction of the forage factory by the Bureau of Agriculture in 1908.

When the honorable the Secretary of War (now President of the United States) visited the Philippines in 1907, he took up the question of a local supply of forage. The present Director of Agriculture prepared for him a lengthy report, showing the method of feeding live stock throughout the Orient but more particularly in the Philippines. It was shown that the successful production of oats and timothy hay in the Tropics is impossible, that the effort should be to find a grain and hay that can be produced here and which will serve as satisfactory substitutes for the better-known American materials. The results obtained by the Bureau of Agriculture in the production and use of these substitutes were given. The system of feeding horses and mules almost exclusively on corn and corn fodder throughout the Southern States was mentioned. The extensive use by the British army in the oriental colonies of green grass was cited as well as the substitution of cattle for a part of the horses and mules, in order to further simplify the question of forage supply. One result of this report was the inauguration of some feeding tests at the Pasay corral in Manila to ascertain to what extent green guinea grass could be substituted for timothy hay. The results were rather startling to some of the military authorities, and fully confirmed the previous conclusion demonstrated by the Bureau of Agriculture that American horses in the Tropics can be fed large quantities of green forage without physical injury or decrease in working efficiency.

It has since been shown that the Bureau of Agriculture is maintaining American horses in good condition, while doing regular work, on a forage composed of a mixed grain of which native flint corn is the principal component, with a liberal supply of green guinea grass. The cost of this forage is less than half of the present cost in Manila for feeding military and livery horses, and one-fourth of the highest cost to a Department of the Civil Government for the keep of the same class of stock.

The work of this board is destined to result in great economy to the Government and will provide a good market for native forage products.

SPECIAL TRAINING COURSES FOR EMPLOYEES OF THE BUREAU OF AGRICULTURE.

By Archibald R. Ward,

Dean, College of Veterinary Science and Chief Veterinarian, Bureau of Agriculture.

A number of considerations have shown the necessity for instituting special training courses for employees of the Bureau of Agriculture by the coöperation of the College of Veterinary Science and the Bureau of Agriculture.

The Bureau is laboring under the handicap of necessarily drawing veterinarians from the United States where rinderpest, surra, and foot-and-mouth diseases do not exist. A fourth one, contagious pleuro-pneumonia, might be mentioned, for although it is not known to exist in the Philippines at present, with the exception of a few cases among certain cattle in quarantine, the possibility of its invasion has put the veterinary corps in such a state of alarm that a careful lookout will be kept for it for some years to come.

Real education regarding a disease can not be had without actual contact with it, no matter how excellent the instructors and text-books may be. Veterinary colleges in the United States are engaged in the work of preparing men to combat cattle diseases common to their own country, and in consequence, can not be expected to give instruction in specialized work that would best prepare a man for Philippine problems.

The bewildering diversity of diseases which the man new to the Philippines will immediately encounter in the field, warrants the maintenance of a brief review course dealing with their characteristics. In cattle there are rinderpest, foot-and-mouth disease, hemorrhagic septicemia, surra, anthrax, verminous bronchitis, and tuberculosis, with the possibility of contagious pleuro-pneumonia and the occurrence of Texas fever occasionally as a complication with some of them. In horses there are surra, glanders, and epizoötic lymphangitis. In both cattle and horses

there are, undoubtedly, other diseases that have been confused with these. Careful pathological work has recently brought two of the above-mentioned cattle diseases to light.

The average veterinarian who enters the employ of the Bureau of Agriculture is generally a young man recently graduated from a veterinary college in the United States, who comes to the Islands for the sake of the novel and extensive professional experience to be had here, and partly on account of the attractions of the travel involved. After two or three years he yields to the desire to go home and settle down for his life work, feeling that too long a stay here would handicap him in his professional career in the homeland. The result is that the personnel of the veterinary corps is undergoing constant change, and the problem of new men is more important here than in similar work in other countries. The Bureau gains by having young active men well qualified to adapt themselves to the new environment without loss of time, and on the other hand, loses because the "breaking in" period occupies such a large proportion of the total time spent in the Islands.

It is with the idea of reducing to a minimum this training period, that special veterinary instruction has been instituted in the Islands. A course of reading on subjects connected with tropical veterinary sanitary science, interspersed with discussions and lectures, is one of the most important features of the instruction. The common cattle diseases pertaining to the Islands are covered thoroughly and the features of the campaign being conducted against them by the Bureau are explained in detail. The methods employed in India, South Africa, Indo-China, and elsewhere are analyzed, and the conditions in those countries as affecting the control of rinderpest are compared with those in the Philippine Islands.

Visits are made to the serum laboratory at Alabang to observe the details of the preparation of serum. Actual observation of the details of the routine work and experiments in progress there afford exceptional opportunities for the new men to become familiar with the value and the limitations of anti-rinderpest serum. Cases of rinderpest are to be seen there daily, affording unlimited opportunities to study symptoms. Likewise, the work there gives an opportunity for the pathologist of the Bureau to demonstrate the changes in the organs produced by rinderpest.

Deaths from surra are frequent enough in Manila to afford opportunities for the pathologist to demonstrate the characteristic features of the internal organs of an animal that has died from this disease. Post-mortem examinations of other diseases

are made as opportunity offers. The abattoir furnishes material for instruction.

The use of the microscope in detecting such diseases as surra and anthrax in material from the live or dead animal in the field is demonstrated, as well as the use of bacterial cultures in confirming a diagnosis.

The various duties of the Director of Agriculture and his deputies, together with those of the provincial and municipal authorities, constitute another branch of instruction. There are a great many laws of the Insular Government and of the provinces and municipalities, besides executive orders of the Governor-General and general orders of the Director of Agriculture, in which the men are instructed. All of these effect the duties of the man in the field. Somewhat related to these are the details concerning monthly and weekly reports, official correspondence, expense accounts, etc., which need explanation.

The inspection of freshly slaughtered and frozen meat, of imported live stock, the disinfection of ships and railway cars, the management of quarantine stations, the issuing of transportation permits, are all details of work which the newcomer is liable to encounter at any time. He is given opportunities to become thoroughly familiar with these matters so that he could assume any of these duties on short notice with the minimum loss of efficiency due to the change. Not the least among the things a newcomer should know are the precautions he should take for the preservation of his own health. The necessary care in regard to drinking water, food, mosquitos, and the like, is brought to his attention in a series of lectures.

The pressing demand for men in the field will preclude bringing in from the provinces many men at a time for this work, and it is not so necessary in their cases, for they have the knowledge, earned in many cases by bitter experiences. Wherever possible, they will take this review course. The men are widely scattered and somewhat isolated. The service needs the strengthening that would result from a free discussion of difficulties by the men in the field with the ones who direct the work in the general office.

At present the work is in a developmental stage. As the facilities are improved, it is intended to expand the course into a closer approximation to the post-graduate training courses at the army and navy medical schools and the laboratory training course of the United States Public Health and Marine-Hospital Service. The instruction outlined above is in progress at present, and other more elementary work is under consideration.

The Bureau employs a large number of Filipino assistants. These men when first employed are entirely ignorant of the first principles of the work in which they are to engage. They scour the country in search of suspicious cases of rinderpest and surra, which they report to the veterinarians for verification. Their duties are thus very important, and their training constitutes a heavy draft upon the time of the veterinarian. It is believed that the efficiency of the corps would be improved by affording opportunities for these men to receive several months' training at the College of Veterinary Science. The Pandacan stock yards will require many men, and it is hoped to perfect arrangements by which the most promising of the Filipinos employed by the Bureau might support themselves in Manila while receiving instruction.

While not directly affecting the field work of the Bureau, the introduction and the stimulation of the practice of shoeing draft cattle, carabaos, and horses is a line of work in which the college could render practical benefit to the live-stock interests. At any time in Manila one may observe carabaos limping from sore hoofs, due to excessive wear upon the pavements, or to the primitive, inefficient substitutes for iron shoes. Should it become clear that candidates for instruction in shoeing animals would present themselves, courses of training open to employees of the Bureau or others, would be made available.

AN OUTBREAK OF DESTRUCTIVE CATERPILLARS IN BATANGAS RICE FIELDS.

By D. B. MACKIE, *Agricultural Inspector.*

In the month of May there appeared in that portion of Batangas lying between Maquiling Mountain and Lake Taal, extending in a southerly direction to the vicinity of the municipality of Lipa, enormous numbers of caterpillars, which destroyed the greater part of the rice crop in that section.

The people seemed to be considerably alarmed, and many requests for information and assistance were received by the Bureau of Agriculture. On June 11 the district was visited by an inspector and it was at once seen that the reports were scarcely, if at all, exaggerated. In some places whole fields of young rice were stripped of their leaves and in many cases the entire plant was eaten off even with the ground. At first no caterpillars were seen, but suspecting that they might be nocturnal feeders, the writer again visited the fields after sundown; this time the pests were observed in large numbers.

The individual coloring of these caterpillars varies greatly, some of them are almost entirely black with only an obscure median stripe of yellowish green, others velvety black with dorsolateral stripes of bright yellow, some almost uniform yellow-green with obscure darker markings, and some a greenish gray with black dorsal spots. The under parts are generally a uniform greenish gray.

The worms climb the stalks of the plant, and, eating the young leaves first, generally consume the entire plant. When disturbed the worm drops to the ground and, after remaining curled up motionless for a few seconds, gets up and hurries to shelter. Previously this species was observed to be more or less solitary in its habits; it seems that in certain cases, where the food supply is insufficient, the pest behaves as the swarming caterpillar and moves from field to field in search of food. The mature larva measures about $1\frac{1}{2}$ inches (36 millimeters). When

this stage is reached the caterpillar stops feeding and wanders about for a few days seeking a sheltered place in which to pupate. This transformation usually takes place under the ground, the caterpillar boring into the soft soil to a depth of 2 or 3 inches (about 5 or 7.5 centimeters). This period generally occupies from eight to fifteen days in these Islands. The pupa is dark brown and measures about two-fifths of an inch (about 14 millimeters) in length, although the female is larger.

A number of larvæ secured for breeding purposes revealed the fact that a large percentage of these were parasitized; upon close examination it was found that fully 30 per cent of them were bearing eggs of some species of tachina fly (a small dipterous insect which resembles the house fly). These eggs were generally laid near the head of the caterpillar, usually on the first two segments, and were attached to the skin by a sticky secretion which hardened upon contact with the atmosphere. More than three eggs were rarely found on one individual.

With this class of parasites the parent fly attaches her eggs to the skin of the host. The young maggot hatches in a few days and its first action is to bore into the body of the caterpillar; this done, the parasite proceeds to suck the juices of the caterpillar, gradually absorbing its vitality until the latter weakens and dies. The parasite, which by this time has reached maturity, then emerges from the dead host and, after crawling a few inches, transforms to the pupa stage. In this operation the larval skin simply shrinks up and turns brown, not being shed, and forms the pupal covering. In a week the mature fly breaks from the pupa and, after mating, seeks its host and deposits the eggs of the next generation. As the life cycle of the parasite is so much shorter than that of the host, it often happens that two broods of parasites emerge from one brood of caterpillars.

The caterpillars responsible for the losses in our fields are one of our native species and have been noted by the author in almost every province of Luzon. They are promiscuous feeders, having been found on rice, tobacco, cabbage, potatoes, and tomatoes. They are evidently *Spodoptera maurita,* a species which, according to the imperial entomologist of India, is found in Borneo and the Philippines.

The appearance of the tachina flies is rather timely, as the people of the infected districts anticipated another outbreak next season. It may be interesting to these people to know that there is little to fear from this insect in the coming years, as all evidence seems to show that its natural enemies have it well

under control and its numbers may hardly be noticeable next year.

Experiments with this caterpillar, which pupates in the ground, show that by being turned up to the sun the pupa dies from exposure, and by thorough cultivation a large number may be destroyed. Periodic outbreaks sometimes occur among our native species, but they are seldom extensive and generally last only one or two years.

NOTE.—In September, while in Iloilo Province, reports were received of a caterpillar which had destroyed a large percentage of the rice in certain districts; from information received there it appears to be of the same species as the Batangas pest.

SOME INSECTS AFFECTING THE TOBACCO CROP.

By D. B. Mackie, *Agricultural Inspector.*

Among the several insect pests affecting the tobacco crop of the Philippines, none have thus far appeared in such numbers that they can be considered a serious menace to the average planter. However, with the cultural methods in use at present, especially in the Cagayan Valley (Luzon), and with the increasing area gradually being brought under cultivation, it is quite possible a more or less extensive outbreak of some one of these pests may occur in the immediate future.

The following notes and suggestions are intended to forewarn the planters regarding these dangers and to assist them in understanding the situation. The remedies herein suggested are such as may be obtained and applied by the average planter, and are believed to be adapted to the local conditions, which, it must be remembered, differ somewhat from those in other countries.

LEPIDOPTERA.

Of these insects the species which does the greatest amount of individual damage is a small light brown noctuid moth, the larvæ of which very closely resemble the corn or cotton boll worm, which annually causes so much loss to tobacco, corn, and cotton in the southern part of the United States. This resemblance is not in appearance alone but in its operations. The American insect is known as the false bud worm, tomato worm, tomato fruit worm, and cotton boll worm. The Philippine species in question has been found attacking the stem, leaf, bud, and seed pods of the tobacco, the leaves and fruit of the tomato, and also young ears of corn. The caterpillars measure about 30 millimeters in length when full grown. They are of a uniform greenish color, sometimes with an obscure median stripe of lighter color.

The eggs are generally laid in the terminal bud, and it is there that the young larvæ first appear. They begin their work by eating off the surface of the tender leaves. As they grow larger

(*a*)

(*c*)

(*b*)

PLATE II.—(*a*) CROSS SECTION OF TOBACCO SEED BOLL EATEN BY BOLL WORM. (*b*) BOLL WORM (ENLARGED). (*c*) ENLARGED SEED BOLL SHOWING METHOD OF ATTACK BY BOLL WORM.

they extend their operations, eating through the bud, and are often found out upon the younger leaves. At this stage they cause the greatest amount of damage, but when they are one-half to three-quarters grown they crawl around on the leaves, eating holes through them in some places, or a section out of the midrib in others; sometimes they eat out the small axillary bud, and after finishing it proceed to bore into the stem, eating downward from 7 to 10 centimeters. It seems to be a favorite habit with them to bore down the stalk of plants which have just been topped. The green seed pods and plants that are allowed to blossom are also attacked. When attacking the latter the larvæ bore into the side of the green pod, eat out the placenta on which the seeds are borne, and then, having finished it, proceed to another near-by capsule.

When more than one individual occurs on the same plant they generally eat one another.[1] When individuals of this species are disturbed they arch the forward part of the body and bend the head under, at the same time emitting a sticky red fluid.

Although mature insects were not reared from eggs, very young larvæ were reared which molted in some cases as many as six times before entering the pupa state. Of the specimens which reached maturity, the majority spent about fifteen days as pupæ, yet some emerged in twelve, while a few needed as many as twenty days.

A few days before transforming into the chrysalis the caterpillars cease feeding and seek some sheltered spot, generally going into the ground where they form a pupal case for themselves out of loose earth particles stuck together with the sticky secretion from the mouth. The moths are night fliers and are attracted to lights in large numbers.

As far as could be observed no regular broods were noticed, larvæ of various sizes occurring throughout the season; yet it was noticeable that about the third week in April very few full-grown caterpillars were to be found and the crop was very free from their attacks. As full-grown larvæ have been found on ears of corn near the end of June, it would seem to indicate that up to that time there had been three broods.

The insect is of general distribution; and although search has not been made for it in the Visayas, it probably occurs there.

[1] Much trouble was experienced in rearing this species because they would persist in eating one another; the victims most frequently attacked were those individuals that had stopped feeding and were preparing to pupate. Another source of trouble was the small red ant which continually ate the newly transformed pupæ.

It has been found in Cagayan, Isabela, Rizal, Batangas, Albay, Sorsogon, and Catanduanes Island, and as it occurs throughout this region there is every reason to believe that it also occurs further south. On Catanduanes this insect was very destructive to corn, the eggs were laid in the silk and the insects eating down into the inside of the ear, fed upon the grains that were in the milk. Infested ears can be readily distinguished by their black streaks.

Remedies.—The first method that suggests itself is thorough cultivation, since the insects pupate just beneath the surface of the ground. By this method the pupæ are turned up and exposed to the direct rays of the sun, which during the growing season is very hot, and thus a large percentage are destroyed.

Hand picking is an excellent method and the only one I have seen practiced on the *haciendas*. There is seldom more than one caterpillar on a plant, and the infested plants are easily detected by the droppings. The greatest trouble is that the insects are not picked off frequently enough to prevent the escape of some individuals of each brood. The present custom is to destroy any insects found on the plants at the time when the first ripe leaves are picked.

CUTWORMS.

Only one species of cutworm has been noted. The adult is a small thick-bodied moth having gray wings with many small diagonal silver markings on the upper surface. Although not found in large numbers it is safe to say that this species is quite plentiful and of general distribution. The reason it is not more noticed is due to its habits of nocturnal feeding and of remaining hidden by day.

The larvæ vary greatly, some being almost black with no spots, while others are ashen gray with a double lateral row of circular dots, the inside half of which is creamy white and the outside half black. Full grown larvæ measure 30 to 40 millimeters.

They are strictly leaf eaters, never attacking either the blossoms or the seed capsules nor boring into the stalk. Although they feed readily enough on tobacco, evidence seems to show that tobacco is not the preferred food plant; where tomatoes, eggplants, and potatoes grow they were found feeding on them, and appeared to be especially fond of the tomato. This insect also undergoes its pupal stage in the ground. The pupæ are about 20 millimeters in length. Owing to their nocturnal habits hand picking will be found difficult and it will be necessary to resort to close cultivation.

PLATE III.—(*a*) STALK OF A TOBACCO PLANT EATEN OUT BY BORER.

PLATE III.—(*b*) TOBACCO PLANT SHOWING BOLL WORM EATING OUT SEED BOLL.

STALK BORERS.

The larvæ of these insignificant looking little gray moths, which are less than 6 millimeters in length are responsible for a great many of the dead plants that are to be seen, especially in the upper part of the Cagayan Valley. The eggs were not found, but the young larvæ bore into the stalk of the plant, entering the stem at the place where it leaves the ground.

As the insect is so minute and the plant grows rapidly at this stage, the wound soon heals. When the insect grows larger and its operations become more extensive its effect on the exterior appearance of the plant may be more readily noticed. By this time the plant has attained a height of about 45 centimeters, the leaves and stalk lack their characteristic fresh greenness and appear decidedly dull and wilted; in the later stages the margins of the leaves turn yellow. Affected plants are easily blown down by moderate winds. Upon examination of the stalk of such plants the entire inner part, which consists of a soft pith, is seen to be eaten out and a small semitransparent greenish white caterpillar is found therein. When this larva reaches maturity it eats a hole at the upper end, which extends almost through the shell. Here it spins a small cocoon of silk in which it undergoes the final transformation. Thus far only two broods have been noted. The adult moths are attracted to lights and may be taken in the houses of the *hacenderos*.

Remedies.—The fact that the insect is attracted to a light shows that a lantern suspended in the field with a pan of coal oil placed beneath it would make a very efficient trap. Many members of this family (Pyralidæ) deposit their eggs at random as they are flying about among the plants. The only method that suggests itself as possible in dealing with the larvæ would be to dip all young plants as they are taken from the seed bed into a strong mixture of some very adhesive poison, such as lead arsenate, which would undoubtedly cause the death of the young larva in the attempt to eat its way into the stem.

ORTHOPTERA.

Three or four species of the Locustidæ were found on tobacco plants. The majority of these individuals were found hidden in the small leaves of the terminal bud, but in only a few cases were they actually feeding. They are pale or pea-green in color, with very long antennæ. From their numbers they can hardly be reckoned as one of the pests. Only one species of this family could by its operations be designated as destructive.

This was a field cricket, the name of which is not yet known. Although not numerous, the fact that they attack the stalk of the young plant at the point where it leaves the ground, frequently cutting it entirely off, necessarily places them with pests of the most destructive type. If allowed to increase it may cause more loss than all other local pests combined.

Remedy.—The only method that suggests itself is the one that was recommended for the stalk borer—that of dipping the plants into a strong arsenical mixture at the time of transplanting from the seed bed to the field.

SAP SUCKERS.

Hemiptera.—Four species of sap-sucking insects were taken on the plantation; one species only, *Dysdercus cingulatus*, was taken in considerable numbers. This is the species which so commonly attacks the okra. Individuals vary in size and color markings. The majority, however, have the orange red with one or more black patches, and the under parts red with a series of white bands, one to each abdominal segment. The sides of the thorax are generally white with three black lateral spots. The antennæ are four-jointed and black, while the beak is three-jointed and of the same color. These bugs are very active, running about on the leaves and stems; they seem to have no preference, feeding from both the upper and under surfaces. When feeding they insert the beak into one of the small veinlets and suck out the sap. While no injury can be noticed at the time, a small brown patch can be noticed after a day or two. Both the adult and the immature insects feed in this manner. The eggs are laid on the under side of the leaf, generally near the midrib; the average number is about seventy-five, though often less.

The injury from these bugs is not great enough to warrant the adoption of any special remedy. They also feed on various weeds and when such are abundant, but little loss by them need be anticipated.

HOMOPTERA.

Plant lice.—These are minute green insects which live in colonies, generally upon the tender young terminal buds. They feed by a sucking beak which is inserted into the soft tissues of the leaf. They are not responsible for a great amount of damage, although they do injure the quality of the leaves by the withdrawal of sap and the possible irritant effect. They excrete a sweet sticky substance which resembles honey; this excretion is much sought after by many insects, especially some of the

larger ants, which protect the aphid colonies for the purpose of getting this "honeydew."

Leaves on which aphids have been feeding are sticky and have a glazed appearance. On these leaves is sometimes found a peculiar sooty black fungus; this is very likely a Capnodium, as this class of fungi seem to thrive only where there is "honeydew."

Remedy.—Destroy the colonies of plant lice by dusting, spraying, or hand picking.

COLEOPTERA.

Melon beetle.—This is a very destructive insect to all of the plants of the melon family and on two occasions it was taken on tobacco plants. The adult is a small reddish beetle. It is injurious both during the larval and adult stages. Its method of feeding is by eating out the entire soft tissue of the leaf and leaving a skeleton of veins which give the leaf the appearance of abacá cloth. Little danger to tobacco need be anticipated from it, as it seems to feed on tobacco only as a last resort.

Remedies.—Arsenical mixtures, especially sprays, will be found the most useful, as this insect is strictly a leaf eater.

BENEFICIAL INSECTS.

Tachina flies.—These are small two-winged flies that are slightly larger than our common house fly, which they closely resemble. They lay their eggs directly upon caterpillars and the young parasite, upon hatching, bores into the inside of the host larva and eventually kills it. Upon the death of the caterpillar the parasite emerges and pupates at once. In some cases the green caterpillars of the tobacco bud worm were found to be carrying the eggs of these flies.

Ichneumon flies.—In two cases adults of these insects were reared from pupæ of the bud worm. They were of an orange color throughout, with the exception of the head which was almost black. Unlike the tachina flies these insects deposit their eggs in either the caterpillar or pupa. This is done by means of a sharp ovipositor, which resembles a fine hollow needle. The egg, upon hatching, assumes the form of a footless maggot which absorbs the life from its host and pupates within it, emerging as a perfect insect. These insects were found to be quite numerous and they evidently exert a very beneficial influence.

Syrphus flies.—These are often called "sun flies" from their habit of remaining poised motionless on the wing during the hours of midday. They are very abundant throughout the tobacco districts of Cagayan and Isabela. Adults are about the

size of the common house fly, but are blackish and banded with yellow. The larvæ of this species are very beneficial on the tobacco plantation, feeding upon the colonies of plant lice. They are small, of a yellowish green color and with a broad dorsal stripe of yellow. The eggs which are laid by the adults in the aphid colony are white and elliptical in form, and are deposited singly. They hatch in seven to nine days and emerge as small maggots. These larvæ begin feeding at once. They seize the aphids by the back and holding them in the air suck the juices out of them.

The larval stage lasts eighteen to twenty days, after which the insect seems to lose color and turn brown, and change into a small elliptical brown pupa. No molts are undergone, nor does the individual cast off the larval skin. The larval skin simply forms the pupal covering. After from nine to twelve days in the pupa stage the mature fly emerges.

It is due to the great number of these flies that so little damage results from the aphide. Due to the ignorance of planters these flies are killed off wherever they are found, as are all other insects found on the plants.

Another species of "sun fly" was noted feeding upon aphids. This was larger than the common species and of uniform gray color. Its method of attack was the same. The Syrphus larvæ are carried off by a large black ant, apparently in order to keep them from killing the aphids from which they get the "honey-dew."

COLEOPTERA.

"Lady bird" beetles.—These little beetles belong among the Coccinellidæ. They are very common on the tobacco plants, and where plant lice exist they are decidedly beneficial. Throughout their entire life they eat nothing else. The species that is most abundant is greenish white with four black dots, two on each wing cover.

The female deposits her eggs in threes or fours on the underside of a leaf near an aphid colony. These are greenish white in color and generally hatch within three or four days. The young larvæ often make their first meal off the old eggshell. They grow fast and are soon running about catching aphids or any other small insects they can get.

They are, at first, a uniform slaty gray but later acquire a row of white spots which are larger at the anterior portion of the body. They have four rows of dorsal spines, the two lateral rows being the longer. A white band encircles the abdomen at its fourth segment.

(*a*) (*b*)

PLATE IV.—(*a*) SYRPHUS FLY WHICH IN THE LARVAL STAGE FEEDS UPON PLANT LICE. (*b*) LADY BIRD BEETLE WHICH FEEDS ON THE (APHIDS) PLANT LICE (ENLARGED).

After running about for eighteen days they get ready to pupate, and after attaching themselves by the posterior end to a leaf they shed their old skin. The new pupa is of a uniform white color but soon changes and shows a double row of triangular blackish markings on the back of the abdomen, the wing scales also turn darker, but the rest remains whitish. This stage is short, lasting only three or four days, seldom more than five, and then the mature insect emerges. The insects soon fly about and, after seeking a favorable location, mate and deposit their eggs.

INSECTS AFFECTING THE DRIED LEAF.

Cigarette beetle (*Lasioderma serricorne*).—The operations of this beetle are not confined to any kind of tobacco. It attacks the partially cured product, cigars, cigarettes, and baled tobacco. Its greatest damage is wrought in the finished products, such as cigars and cigarettes, through which it bores small holes. Conditions in the Philippines are extremely favorable for its propagation and its maintenance; complete extermination would be almost an impossibility. Large amounts of tobacco refuse, which litter the floors of the warehouses offer abundant shelter and food. It also has easy access to the stored product in the nipa houses when the product is stored in piles for curing. In many of the factories it also finds a breeding place in the waste portions of the leaf which are scattered about the floors.

Remedies.—As yet no absolute remedies have been found. Fumigating the dried leaves with carbon bisulphide kills the larvæ and adults but not the eggs. The same method, using formaldehyde gas instead, will kill the eggs also, but it is so deadly that few people care to use it. The greater part of the tobacco which is affected by this pest becomes infected while stored in the warehouses. When we arrive at the stage when cement warehouses can be built, which are free from cracks and can be properly fumigated, then it will be time to look for a diminution of this pest.

INSECTICIDE EXPERIMENTS.

While investigating the tobacco pests in the Cagayan Valley a series of experiments were carried on with insecticides. Excellent results were obtained from the use of arsenate of lead used at the rate of one-half kilo to 80 liters of water. As a killing agent this proved very effective, but some question arises as to whether the curing of the leaves would be in any way interfered with, due to the minute particles of the arsenate which might still remain on the leaves. Regarding this matter

authorities differ, some making one statement and some another. As the earlier leaves produced by the plant are of little value, it is safe to say that a good heavy spraying of the young plants would produce no detrimental results, as the best leaves are not then developed, and greatly lessen the numbers of both the bud worm and the stalk borer. Experiments were also carried on with Paris green, although they were not made by the author. In this work the poison was used dry and applied as a dust bath to the plants by means of a hand bellows. The results obtained were excellent, except where, through carelessness, the native operator applied too much and burned the leaves in patches.

SUMMARY.

As the great bulk of the tobacco crop of the Cagayan Valley is produced by small planters, few of whom plant more than 10,000 plants and do not have sufficient capital to invest in spraying apparatus, the hand bellows, for instance, appeals more strongly to them. Such apparatus is light and easily handled and can be laid down at pleasure, while the insecticide pumps need constant attention, and they always require two or more laborers to operate them.

Better and cleaner cultivation is the new idea which, from its beneficial results to their crops, is being slowly taken up, and it is to be earnestly hoped that its popularity will rapidly increase.

Whereas local demonstrations and advice may do much toward overcoming many of the present difficulties, large plantations, supplied with modern equipment for controlling insect pests, will do more to educate the people up to an appreciation of the value of preventatives.

THE AGRICULTURAL ASSOCIATION AND ITS VALUE TO THE PHILIPPINE FARMER.

By E. A. Coddington,

Secretary of the Insular Agricultural Association.

THE AGRICULTURAL ASSOCIATION.

An agricultural association is an association or society for the benefit of farmers or agriculturists, and in any country, if it succeeds, it must improve the social, educational, economic, and general welfare of those who live upon the farms.

The character or type of the agricultural association is as varied as the needs of the farmers who constitute its membership. The purposes and work of most farmers' associations in the United States differ somewhat from the work for such associations in the Philippines. In fact, the character of such associations varies largely in different parts of the United States and often in the same State.

Agricultural associations in Europe vary widely in their names and objects from those in the United States. For example, in the United States the work of most associations is confined more or less closely to raising larger and better crops—the science of agriculture; in Europe, especially in Germany, France, and Belgium, these societies economize millions of pounds [1] on the purchase of supplies for farmers and farming. Denmark stands out as the chief example of successfully organized farming; her dairies are the models for the world. In Germany coöperative credit societies are among the most prominent agricultural associations. It is clear that the subjects which would most interest farmers in some parts of the Philippines would be of little interest to those in other sections of the country.

The agricultural association, therefore, can not be confined to any one phase of agricultural progress or development, but the successful association must meet the needs and demands of the farmers in its particular locality or district. This variation in the form and work of agricultural associations is well

[1] One pound sterling equals ₱9.732.

illustrated in the United States where we have the American National Live Stock Association, National and International Dairy Associations, stock-breeders' associations, forestry associations, National Woolgrowers' Association, National Bee Keepers' Association, horticultural societies, American Breeders' Association, etc.

KINDS OF ASSOCIATIONS NEEDED.

In this country there is an almost untouched and an unlimited field of work for agricultural associations. If Philippine farmers would interest themselves in stock breeding and organize an energetic stock-breeders' association it would be the beginning of a new era of prosperity not only in farming but in the general prosperity of the country. There is a great need for a live-stock association in the Philippine Islands to arouse the stock growers of this country to a greater interest in this industry. Such an association would work to prevent the importation of diseased cattle, horses, and live stock; its members would work to prevent and to eradicate contagion amongst their own stock and give the Government hearty support in meeting these problems.

The field for horticultural development is practically untouched. I am not aware that a single Filipino has interested himself in any special development of the horticultural possibilities in the Philippines. If anyone is sufficiently interested in this subject to give it serious consideration, I invite his attention to what has been done in the way of improving tropical fruits in Florida and southern California. The history of this work and the possibilities for a similar work in this country are such as to arouse the greed for gain, if not the scientific and philanthrophic interests of one desirous of giving to his countrymen those products which would not only add health and comfort, but prosperity and luxury, to living in the Philippines.

We should have sugar-growers' associations, tobacco-growers' associations, fiber-growers' associations, coconut-growers' associations, etc.

Mr. Roosevelt has very wisely stated the needs of country life as follows:

"(1) *Effective coöperation among farmers to put them on a level with the organized interests with which they do business.*

"(2) *A new kind of schools in the country which shall teach the children as much outdoors as indoors and perhaps more, so that they will prepare for country life and not, as at present, mainly for life in town.*

"(3) *Better means of communication, including good roads and a parcel post, which the country people are everywhere and rightly unanimous in demanding.*

"(4) *To these may well be added better sanitation, for easily preventable diseases hold several million country people in the slavery of continuous ill health.*"

THE NEED FOR RURAL SOCIETIES AND ASSOCIATIONS.

As to the need for agricultural associations or unions there are many and most urgent reasons for the farmers to bind themselves into such unions, and these reasons are, I believe, more pressing in the Philippines than in any other country where such associations exist to-day. The condition of our rural population to-day is most helpless. The people have never been taught to help themselves or to organize themselves for the purpose of improving the material, educational, or social conditions of country life. There is scarcely a single active and energetic organization composed of people who actually live on the farms, the purpose of which is to promote the economic, educational, and general welfare of the people. In the past few years a number of associations have sprung up in the more prosperous sections, especially in the Islands of Panay and Negros, and in the Provinces of Bulacan, Pampanga, Albay, and Cebu, which have for their purpose the improvement of conditions on the farms and *haciendas*.

To-day the fundamental problem in the Philippines is to build up business and commercial confidence. One of the greatest obstacles to the organization of agricultural societies or unions is the lack of confidence on the part of the people, not only in strangers but in their own countrymen and neighbors. From time to time efforts have been made to organize companies or corporations of Filipinos for the purpose of carrying on extensive business operations, and they have almost invariably met defeat on this account. Repeated efforts have been made, in the provinces, to organize companies for the purpose of competing with foreign business houses, but in practically every instance one wealthy Filipino after another has withdrawn because he was not willing to trust others to handle his money. At present efforts are being made to establish sugar centrals in the heart of the sugar-growing sections to assist the sugar farmers so as to enable them to compete with the sugar growers in other parts of the world, but the most prosperous *hacenderos* in the country hesitate to invest their money in a proposition which is so new to them.

The first thing that impresses an American on visiting the provinces in the Philippines is the crude and even antiquated methods of agricultural work and, in general, the complete absence of labor-saving machinery. The agricultural methods employed on the small farms in the Philippines are as old as history, and the tools used by the farmers are usually made by themselves or in the shop of the neighboring carpenter or blacksmith. Another need for an agricultural association is to study modern methods of planting, cultivation, harvesting, and preparing crops for market; to study modern labor-saving machinery and to discover what kinds of these machines are adapted to use on Philippine farms.

In the hemp sections, and in the sugar, coconut, and tobacco sections of the country as well, the great mass of our farmers are under obligation or in debt to the buyers and dealers in their products. Many of them have been compelled to contract their hemp, sugar, coconuts, or tobacco at a stated price in order to get money to cultivate their farms and harvest their crops. This condition exists in a greater or less degree in all parts of the Islands and is decidedly prejudicial to farmers. In some cases they are entirely dependent upon the money lender, who is usually the large buyer of their crop. In such cases farmers have no choice as to the time of sale or the price which they will receive for their crops. Such conditions place the great mass of Philippine farmers wholly at the mercy of large organizations of buyers or money lenders. Furthermore, farmers have great difficulty in borrowing money from banks or private individuals at reasonable rates of interest. This is partially owing to a lack of appreciation and sense of obligation on the part of those who borrow, so that the greatest precautions have to be taken by banks and those who loan money.

The Government has established an Agricultural Bank, but the officers of the bank state that about 80 per cent of the applications for loans have to be refused because the farmers can not furnish proper titles to their lands as security. There is a great need for agricultural or credit societies from which responsible farmers can easily obtain sufficient amounts of money to enable them to purchase necessary farm machinery, to pay necessary labor, to carry on the work on their farms with the least expense, and to relieve themselves from debt.

In almost every part of the Philippines farmers are handicapped by the lack of transportation from their farms to the markets. In many places farmers have selected land near navigable rivers or the sea, in order to facilitate the transportation

of their crops. It is well known that in nearly all of the provinces many of the highways are in a deplorable condition. Thanks to the untiring energy of those in charge of this work, more especially the Governor-General, good roads are being constructed in nearly all of the leading agricultural sections. In three of the largest Islands there are modern railways, which furnish transportation; but this is only a small part of the problem of transportation, as railroads and steamship lines are of little value to farmers unless they have a good and cheap means of transportation from their farms to railway stations or ports of call for steamships. We need agricultural societies to promote good roads and good transportation in the country.

In every province our farmers have had their crops destroyed by plant pests or their live stock by animal diseases. There is scarcely a farmer in the Philippines who has not had to fight locusts, beetles, rats, or cane borers which destroy the common crops of the country. On the other hand, what farmer has not suffered the loss of farm animals from rinderpest, surra, foot-and-mouth disease, glanders, and cholera which carry off the live stock raised on the farms? Notwithstanding the common depredations of these pests and diseases there has been no united effort on the part of the farmers as a whole to destroy or eradicate them. The Philippines suffer more from these pests and diseases than other countries, for the simple reason that the farmers have never united in an intelligent warfare against them. Furthermore, our laws have permitted the importation of plant pests and animal diseases from other countries, so that to-day we have one of the worst situations, in this respect, to be found in any agricultural country. The Government has worked almost single handed and alone to stamp out animal diseases, and it has had to pass laws compelling the coöperation of local officials and farmers for carrying on the work.

In many places we hear the most progressive farmers complain of the lack of laborers. From the sugar sections in Negros, from the Moro Province, and from the tobacco districts this demand for laborers has been made emphatic. The problem is a most important one, which has not yet been solved by the farmers or the Government. The coöperation and assistance of everyone who is interested in the welfare of the country is needed. Organized farmers' associations could do much toward the solution of the labor problem on the farms.

From the hemp buyers we hear the complaint that the fiber is not satisfactorily graded or prepared for the market, and that it is not properly stripped or cleaned. On the other hand, hemp

growers claim that there is a decided inclination on the part of buyers not to grade the farmer's fiber, but to offer him a lump sum for it as he brings it to the local market. By far the larger part of Philippine hemp exports is graded and baled in Manila or Cebu and shipped to the central markets in London and New York. The reports from New York and London always indicate that there is a good price and a large demand for high-grade fiber. Notwithstanding these conditions there are very few places in these Islands which produce a large amount of first-class fiber. Repeated reports from the tobacco sections state that buyers generally decline to grade the farmer's tobacco but offer him a lump sum for his crop or as much as he cares to sell. These conditions do not lead the farmers to realize the importance of properly cleaning and grading their hemp, or of growing the finer grades of tobacco, or making an effort to look into or study the conditions and demands of the market for the purpose of raising a larger crop of better quality. Farmers should take steps to remedy bad practices on the part of both growers and dealers.

One of the first things noted by the business man who travels in the country is that, notwithstanding there are many improvements in the towns, rarely can one find any improvements on the farms or the lands outside of the towns. It is true that a somewhat larger acreage of land has been put under cultivation from year to year and the methods of cultivation are slowly improving, but we have yet to see any evidence of improvements made on the farms. There is a great need of extending into the country this progressive movement which has been felt in the towns. The work of promoting rural progress is a proper one for the agricultural association.

Everywhere farmers are handicapped by the lack of knowledge and coöperation to put them on a level with the organized interests with which they have to do business. Philippine farmers need laws to protect their interests and to give them an equal chance with buyers and dealers in farm products. In the Philippines, perhaps oftener than in any other agricultural country, the farmer's crops are destroyed by storms or *baguios* and by plant pests, his property is destroyed by fire, and his stock by animal diseases, but against such calamities he has no protection. In the most highly developed agricultural countries farmers have formed societies or associations for insurance or protection against such losses. By mutual coöperation and the payment of a small fee each year by a large number of farmers, those members who suffer such losses are reimbursed, at least

to a large extent, for the damage done to their property. Philippine farmers need such societies for mutual protection and insurance against losses common to the country.

I have mentioned ten specific needs for agricultural associations in the Philippines or lines of work which agricultural associations are doing in other countries. There is great need in every province and in every town of the Philippine Islands for societies with a fixed purpose for the improvement of the farms and the health, comfort, and prosperity of those who live upon them.

THE VALUE OF THE AGRICULTURAL ASSOCIATION.

The value of an agricultural association to the farmer will, in all cases, depend upon the interest taken in it by the farmer himself, and the energy and effort he puts forth to make the association a success. Unless the association adapts itself to the needs of the farmers in the community it is doomed to be a failure. The first associations in the Provinces of Oriental and Occidental Negros, Iloilo, and Pampanga should be for the sugar growers; on the other hand, the business of first importance for an agricultural association in the provinces along the eastern coast of the Islands should be the fiber-growing industry; while in the Cagayan Valley tobacco farming takes precedence over every other line of agricultural work, and an agricultural society in that section should first give attention to the needs of the tobacco farmers.

The membership of the association should not be confined to the farmers alone, but as soon as the association is well organized the farmers' wives and daughters, as well as their sons, should be admitted to associate membership and take part in meetings. The teachers and the pupils of the schools should furnish music, recitations, etc., for the entertainment of members and guests. The value of the association depends very largely upon the ability of its members to interest practically everyone in the community. As a result of the interest of the whole community there will be increased confidence, a better understanding of the rights of individuals and of the laws by which they can maintain them.

The first work of an agricultural association under any name or in any section of the Islands should be to study better methods of agricultural work; it should study modern labor-saving machinery and its use on Philippine farms; it should consider such questions as drainage, irrigation, good roads, better labor conditions, relief from debt, insurance against storms and fires.

So far there has been little or no effort along these lines on the part of Philippine farmers.

An equally important work for the agricultural association is to protect crops against the ravages of locusts, rats, beetles, the sugar-cane borer, etc., and farm animals from communicable diseases.

This work must be done largely by the farmers; the Government can only guide and assist them. The purpose and work of the Bureau of Agriculture is to advise and direct the farmers as to the best methods of eradicating these pests and diseases. Rinderpest, surra, foot-and-mouth disease, glanders, and cholera have caused the death of millions of work animals. The farmers should understand that this work is theirs, that the Government will not take upon its shoulders their responsibility in this matter. They can not hope to enjoy that prosperity and success which come to intelligent farmers in other countries until they seriously interest themselves in these matters and accept the responsibility.

A brief statement of the value of agricultural associations in other countries may serve to show Philippine farmers what it is possible for them to accomplish through such associations for the improvement of farming and the general improvement of conditions in the country.

Mr. Charles Douglas in the "Transactions of the Highland Agricultural Society of Scotland"[1] states that the agricultural interests of the different countries in Europe are highly organized; that more than 50,000 coöperative societies organize the business of farmers in France, Germany, Austria, Italy, Switzerland, Belgium, and Denmark.

Germany has made similar progress to that of Denmark by kindred though less developed organization. There purchase societies, supported by a carefully organized system of coöperative banks, economize the expenditure of millions of pounds on the materials for farming. Coöperative purchase has developed largely in France. In Belgium there has been, since 1895, an extremely rapid development of coöperative societies, which have greatly added to the agricultural wealth and resources of the country. Italy has copied in her coöperative development all of the best models of other countries, and presents in many respects the most perfectly systematized and the broadest national effort that is to be found anywhere.

Ireland possesses a much more developed system of coöperation than either England or Scotland. The Irish Agricultural

[1] The Tropical Agriculturist, September, 1910, Coöperative Organization in Agriculture.

Organization Society has been, and still is, the inspiring force of agricultural progress in Ireland. It has affiliated with it 346 creameries, 261 credit societies, and 307 societies for other purposes.

He also says that in England the development of agricultural organization has been both later in its origin and slower in its progress than in Ireland. The Agricultural Organization Society, under whose guidance and inspiration great progress has been made, now has affiliated with it 302 agricultural coöperative societies of various kinds, with a membership of 15,000 and the annual balance has increased in seven years from £9,467 to £850,000.

In Australia and New Zealand agricultural organization and agricultural and industrial expositions have received a great deal of attention. Queensland alone has 225 agricultural, horticultural, and pastoral societies. New South Wales has 41 agricultural associations and Western Australia has 115 agricultural and affiliated societies, while New Zealand has 33 fruit-growers' associations. Agricultural societies have also received considerable attention in India, the Straits Settlements, the Federated Malay States, and Netherlands India. All of these countries have given much more attention to agricultural and industrial organization than the Philippines.

Among the most important institutions, which in most parts of the world are under the control of agricultural or industrial societies, is the agricultural and industrial exposition. These expositions bring together exhibits of the best products from different parts of a province or state and places them side by side so that farmers from different sections can see how the products from different parts of the country compare. The natural pride of all farmers and manufacturers leads them to inquire as to how the farmers or manufacturers in a certain part of the country have raised or manufactured better products than those produced on their own farms or in their own shops or factories. The farmer naturally inquires as to the soil and climatic conditions under which the superior products were raised. He also inquires as to the methods of planting, cultivation, and harvesting the crop, and will endeavor to make his products the best for the next exposition. The agricultural and industrial exposition leads to the most healthy and beneficial competition and, indirectly, to the rapid development of the country. The organization of expositions in the agricultural sections of the most civilized countries of the world has been carried on and developed to a very marked extent. In the United States, according to the Implement Age, of June 23, 1910, there

will be held during the year nearly 1,100 State and county fairs, or an average of over 20 for each State and Territory. The large number of fairs and expositions which are held from year to year in the United States in a large measure accounts for the United States being the most progressive agricultural country in the world.

I have already spoken of the burden of debt, of the unfavorable financial conditions which exist among the farming population of these Islands. One of the most important organizations which can be brought to your notice is the society which has relieved the farmers in other countries from debt and, if established and wisely carried on, may bring the same freedom from debt to farmers in the Philippines.

Mr. Henry W. Wolff,[1] in his standard work on the People's Bank, states that in Germany alone the huge sum of £240,000,000 was loaned by coöperative credit banks in 1908, and that within the past few years wide stretches of new country have been put under cultivation. He claims that the material changes resulting from this system have been no less striking than the moral reforms achieved. Speaking of the indebtedness of Indian farmers, the Indian Agriculturist, June, 1910, says: "It is one thing to lend money to the ryot indiscriminately and quite another to teach him the value of credit and to awaken his power of thought and his sense of responsibility." A resolution of the Indian government points out that the confidence felt in the societies is enabling them to obtain money in the outside market. In Burma the Bank of Rangoon has undertaken to finance the local societies, and important movements to a similar end are in operation in other provinces. The problem of supervision is a more serious matter. In a circular issued in 1908, the government expressed the conviction that the solution would be found in the organization of the societies into local unions. A further resolution repeated this opinion and indicated that the unions should not only finance their own societies but supervise them and encourage the further growth of the movement in definite areas.

One of the most striking examples of self-help through the medium of a coöperative credit society is found in an article on "The Coöperative Credit Society of Hulkoti," a village in the Dharwar district which lies almost at the southeastern extremity of the Bombay Presidency.[2] Hulkoti is a small village which has the good fortune to have a railway, a good highway, a post-office, and a boys' and girls' school. The initiative in es-

[1] "The Progress of Coöperative Credit," The Tropical Agriculturist, August, 1910.

[2] The Poona Agricultural College Magazine, October, 1910.

tablishing the society came through a government official who started the society in 1905 with a capital of 2,600 rupees;[1] this was soon increased by a loan of 2,000 rupees from the government. The society had 15 members to start with. All of the money at its disposal was loaned to the people without allowing it to remain idle. At the end of the second year its capital was considerably increased and its membership was 60. When the funds of the society exceeded the usual needs of the people it turned its attention to redeeming its members from their debts. To this end 4,000 rupees were borrowed from the Bombay Urban Society and most of the debts of the members were soon paid. As the advantages of the society were felt and appreciated by the people, most of their small savings were placed with it, and capital flowed in from year to year until at present the membership has increased to 160 and its capital to 15,000 rupees, with a reserve fund of 1,800 rupees. The society pays 6¼ per cent interest on fixed deposits, 3 to 4 per cent on current deposits, and charges its borrowers 9 per cent. It pays interest to depositors every six months. Its bank is the postal savings bank.

Mr. Douglass, in speaking of the value of agricultural associations and coöperation on the part of the farmers, says:

> No skill in the other work of the farm can enable the farmer to compete successfully with his foreign rivals unless he adopts their more developed business methods. * * * Only by combination is it possible to secure for the small holder that degree of equality with the large concern which is essential to his economic existence. No force makes more strongly in the direction of education and agricultural improvement generally than does coöperation. It brings new ideas and methods. It gives the stimulus of better profit to the effort to obtain a larger production from the land. * * * Its effect in other countries has been to stimulate and revive rural life on its social, no less than on its economic side, and to check the drift toward the towns, which is largely due to the decline of social conditions in the country.

As already stated, the value of the association depends upon the enthusiasm, the energy, the effort and the determination of the farmers to make it a success. Just as your income depends upon your earning capacity or your wisdom in placing your investment and your capital invested, so the success of agricultural associations in the Philippines depends upon the efforts of the members, what they put into them, and their willingness to make personal sacrifices for the common good, for the progress and development of the rural community. In the words of Mr. Roosevelt, *"Our civilization rests at bottom on the wholesomeness, the attractiveness, and the completeness as well as the prosperity of life in the country."*

[1] One rupee equals about ₱0.65.

PROVINCIAL REPORTS.

Mountain Province.—Rice, the principal crop in San Emilio, is in excellent condition and about half matured. The people there have a good system of irrigation of native and Spanish construction, the stone conduits and ditches are found throughout that section. Rice is a little more than fair in Tagudin, the usual area being planted. In the Mancayan Suyoc district very little rice is grown and the people are compelled to buy. Nevertheless, with their numerous herds of cattle, their coffee and gold mines, they are considered the wealthiest Igorots in this subprovince. It is estimated that these two towns import hogs and rice to the value of ₱10,000 each year. Coffee in some sections is somewhat better this year, both in quantity and quality, as no typhoons have passed over the province this season, yet it will be some time before the trees fully recover from the storms of the last five years. (Extract from the report of D. B. Shoemaker, veterinarian, Cervantes.)

Pangasinan.—The condition of crops in this province is fair and in the western section they are better than last year. Some land was not planted on account of lack of rain during the planting season and will now be planted with maize and tobacco. The farmers are having ideal weather for the rice harvest. A good start has been made with the early rice, and it appears to be of a good quality. Very little rain has fallen during the month of October. Cross country roads are drying rapidly, and will soon be in shape for traffic. (Report of W. A. Kliphardt, veterinarian Dagupan.)

Tarlac.—The late rains will bring the coming rice crop up to last year's yield in the province as a whole. The uplands in some towns could not be planted, but the lowlands, which can not be utilized as a rule, owing to much rain, are making up for the loss.

Rains were very scarce during the first two weeks of October, and there was absolutely no rain during the last two weeks, so that it was thought for a while that all crops not under irrigation would be a total failure, but about November first

there was a continuous rain, not heavy but enough to give some encouragement to the farmers. Some of the farmers who are able to irrigate do not seem to take advantage of it, but rather appear to expect rain. There is some talk of a caterpillar affecting the rice while dry. (Reports of the senior inspector of Constabulary and James Hill, veterinarian, Tarlac.)

Zambales.—Botolan has been the only municipality infected with rinderpest, and it has been clean since the 4th. The quarantine was raised on the 20th and the Constabulary guard of six soldiers returned to Iba. The veterinarians made forty-two injections of serum during the first week, which was the third injection for these animals. During the month the veterinarian states that he personally inspected every municipality in the province.

A case of glanders was found in the municipality of San Marcelino, barrio of Santa Fe, on the 12th. As the owner could not be persuaded to kill the horse, it was placed in quarantine a considerable distance from town. No other dangerous communicable diseases were found in the province. (Report of W. K. Howard, veterinarian, Iba.)

Pampanga.—There is very little hope for a good harvest this year on account of the late rains. The last rain benefited a few farmers by giving them an opportunity for replanting, but the rice that has been planted some time is beginning to mature. Sugar cane is in fine shape, but it is planted too close. The sun can not get at the stalks and workers can not cultivate it, and as a result the cane grows to enormous height, but is small and has little juice.

It is believed that if a central mill were established in San Fernando to show the cane growers the advantages of modern sugar milling they would take an interest in it at once.

The barrios of Matomo and San Nicolas, Arayat, are infected with rinderpest, and Constabulary guards have been furnished at the request of the provincial veterinarian, by authority of the district adjutant. Twelve carabaos have died of rinderpest in the barrio of del Carmen of Floridablanca, and a patrol reports six others suffering from the disease. (Extracts from the narrative report of the senior inspector of Constabulary of Pampanga.)

Bulacan.—Sugar cane is in fine condition and prospects are excellent for an abundant harvest. Due to late rains, in some parts of the province the rice land will remain uncultivated this year and some will not be transplanted before October 10. The farmers claim that if present rains continue the crop will fall

5 or 10 per cent short of the average. (Extract from the narrative report of the senior inspector of Constabulary of Bulacan.)

Cavite.—The late but heavy rains have given the people of the province much relief, and their anxiety concerning their crops has entirely disappeared. Prominent planters state that the harvest this year will exceed that of last. Weekly sales of abacá frequently reach as high as ₱10,000, though the cost of transportation to Naic lowers the margin of profit to the growers. (Extract from the narrative report of the senior inspector of Constabulary of Cavite.)

Tayabas (Boac).—The early planted rice is being harvested and will probably average a little more than one-half of a normal crop. There is considerable copra and hemp being marketed at this time, the copra being almost a normal yield, for the first time in years. The rainy season is on in Marinduque and may be expected to continue during the months of November and December, notwithstanding this, the upland rice is not planted as a rule until the latter part of the rainy season. (Report of David C. Kretzer, veterinarian, Boac.)

Nueva Caceres.—During the first part of the month there were a few cases of rinderpest in the towns of Goa and San José in the Partido de Lagonoy, but fortunately Mr. Stickney was on hand to control the outbreak before it had a chance to spread. As the full report of deaths has not yet been received the results of the disease are unknown, but it is believed there were not more than 6 deaths, out of 11 cases, 2 in Goa and 4 in San José. During the month there have been reported 14 cases of contagious and infectious disease in the province, 12 of which were rinderpest and 2 surra. One of the surra and 6 of the rinderpest cases died.

Rice planting is going on rapidly and will be finished by the middle of the month, with a somewhat larger acreage than last year in spite of the drought having held back the planting. The more progressive farmers of this province, when they found that some of the land was too dry to plant, went to work on the low wet ground until the rains came, so that when they were in condition to work the dry ground the low ground was all planted. As a result, the end of the planting season will not be much later than usual and very little replanting will be necessary. Some of the earlier crops are being harvested and the owners will be able to replant this ground and get another crop this rainy season.

The copra crop is still coming in, notwithstanding most of the growers have been depending almost entirely on the sun to

dry their product. A great many growers are now putting in driers of a more or less crude make, but nevertheless effective. There is quite an increase in the area planted this season as the people are beginning to realize the value of coconut products.

Corn is becoming more of a food crop, and quite a number of people plant corn where a few years ago they would plant only sweet potatoes. In clearing new ground especially, corn is being planted in place of other native crops.

In spite of the low prices of abacá the planters are still selling large quantities of that product and trying to find better methods of handling it so as to make it more profitable.

The rainfall for the last two weeks of the month was very slight, but light daily showers kept the crops growing, and the last two days marked the heaviest rainfall of the season.

Two immense swarms of locusts have been flying about the rice crops during the entire month, but owing to the watchfulness of the farmers they have kept them flying from one place to another so that very little damage was done. Some hope that the last two days of rain have driven them to cover and that they will not bother any more. (Report of Benjamin C. Ray, agricultural inspector, Nueva Caceres.)

Leyte.—There was an outbreak of rinderpest in San Isidro, Leyte, in August and September, but there have been no new cases or deaths during the month. Since getting Constabulary soldiers, a quarantine established, corrals built, caretakers and guards on duty day and night at the corrals, there has been a very large decrease in deaths and new infections. There are also good corrals and good quarantine in Barugo, where five animals are still confined, but will soon be released. There have been no new cases or deaths from rinderpest during the month. All the animals in infected barrios have been inoculated, both at Carigara and Barugo; some of them several times. At the beginning of the month eighteen Constabulary soldiers were on duty, four in Barugo and the rest in Carigara. Six of them have returned to their station as the quarantine has been raised in several places. There was a small outbreak of surra among the horses in Tacloban, where there are only about one hundred and twenty horses. Doctor Lauman has killed three, several died and two have been quarantined as suspects. Several horses died during the month in Palo, probably from surra. Surra is also reported from Abuyog. Hinungan is at present the worst situation in Leyte. There are only about five hundred carabaos in the municipality and twenty of them are dead or have rinderpest. The disease has reached Hinundayan, where Doctors Lea-

vitt and Edwards and ten Constabulary soldiers from Maasin have gone to combat it. At Ormoc there have been seven deaths from rinderpest and two in Baybay. (Report of Charles H. Leavitt, acting district veterinarian, Leyte.)

Cebu.—An exceptionally good crop of tobacco has been harvested along the north and west coasts of Cebu. The prevailing high price of corn, owing to a short crop, and the lack of the necessary food supplies complicate the situation. This state of affairs is probably most severe in the municipality of Alegria. The poor farmer of this province has yet to learn the necessity of providing for an emergency, of having a variety instead of concentrating his every effort in one direction, and until this condition of affairs is adjusted it must be conceded that the individual farmers in question will not rise far above their present plane, by reason of their indebtedness to others for the maintenance of themselves and their families.

Rinderpest and surra are still prevalent in Cebu, with a few cases which are under control in other towns. On September 30 this office furnished R. O. Porter, veterinarian for the Bureau of Agriculture, a detachment of soldiers for quarantine duty in the barrio of Talamban, city of Cebu. This detachment is still on this duty at that place and is the only one now performing work of this nature.

Locusts are still present in large numbers in the northern part of the island. The inhabitants appear to have concentrated their efforts to exterminate the pest. (Extract from the narrative report of the senior inspector of Constabulary of Cebu.)

Bohol.—The rice and corn crops do not appear to be as good as last year on account of the heavy rainfall and the floods. Coconut trees are being planted everywhere, and it is gratifying to see the energy put forth by the people for the cultivation of coconuts. Maguey is hardly harvested on account of the low price in the Cebu market which makes it impossible for the farmer to cultivate this crop with any profit. Lectures on the treatment of this plant would be greatly appreciated by the people, as their methods of harvesting are very crude at present, and much is lost in its preparation for market. Hemp is harvested in small quantities in the interior, but as there are no roads it is carried over the trails pico by pico to the coast towns. (Report of the senior inspector of Constabulary, Tagbilaran.)

Oriental Negros.—Rinderpest is still in Oriental Negros, but in less virulent form. With the additional aid from the Constabulary soldiers called into quarantine service on the 23d, it is

hoped that this disease will be completely stamped out before it gets a foothold in the province. Double corrals are being constructed when necessary, and every effort is being made to eradicate the disease. Ex-Governor Larena, of Bais, reports that no new cases of rinderpest have developed in the town within the last ten days. A mild outbreak of rinderpest was reported in four towns of the province, the origin of which was traced to the importation of carabaos from Surigao Province some two months previous to the outbreak.

The sugar planters are busy preparing their mills and warehouses for a large harvest of sugar, as the grinding season is near at hand. Much new land is being broken up and the growing cane is doing well, although due to the lack of rain in July and August it is reported as below the average growth for this time of year. (Report of B. J. Eno, veterinarian, Dumaguete.)

Occidental Negros.—The crop and acreage of sugar cane is large this year, and weather conditions are very favorable for producing the proper amount of saccharine matter, which is so necessary for a heavy yield per hectare. Many farmers are now manuring their lands, some for the first time. In Talisay and Bacolod several *hacenderos* have given their land a dressing of lime, ashes of bagasse and other residue from the manufacture of their sugar. One of the Mr. Lacsons of Talisay has spent ₱1,000 this year for lime, as his land will not produce a crop without manuring. In Manapla many farmers are manuring their land; however, these are all old lands that have been cropped for many years. In other places such measures are unnecessary.

There will be a small crop of rice this year on account of the severe dry weather during July and August. The immense acreage of rice lands between Hinigaran and Isabela have had insufficient rain, but many good crops are seen on the lowlands and several early crops have already been gathered. We are having another dry period which will make the planting of late rice impossible. An effort is being made by the provincial governor to get the people to plant corn. The corn crops were excellent but another crop can not be expected this year as nearly all available land is planted to sugar cane.

Small quantities of abacá are growing in all of the foothills, but the distance to market and the low price offer no special inducement for the production of this crop, although a fine grade of hemp is grown except along the coast. Coconuts are a good source of revenue and there are fine groves along the west

coast. Copra is shipped in small quantities from Ilog, Himamaylan, Binalbagan, and Cadiz.

When a Government system of irrigation is established the province will be able to raise all of the rice necessary to supply its inhabitants. In the meantime much can be accomplished in the way of private irrigation on a small scale by using force pumps to utilize the excellent water supply. In many agricultural sections, especially east of Silay, Talisay, and Bacolod, but little outlay would be needed to install hydraulic rams or connect irrigation pumps with the many *hacienda* water wheels already in operation. (Extract from the narrative report of the senior inspector of Constabulary.)

Iloilo.—A large area of land in the interior towns was planted with rice during the latter part of last month and the first of this month. As rain has been falling frequently the late crop is doing as well as could be expected. The farmers in Dumalag, Capiz Province, are harvesting their first rice crop, which is as good as usual, while the land planted later is in excellent condition, and the rice is heavy and well filled. The people of Miagao, Iloilo Province, have been harvesting their rice and at present probably one-fourth to one-half of the crop has been gathered.

In the mountanous part of Miagao near the Antique border the people are cutting hill rice. They planted the lower lands for a later crop which has not headed yet. Some plowing is being done in preparation for the next corn crop, but as yet none has been planted. (Report of William A. Smith, veterinarian, Iloilo.)

Antique.—But little rice has been harvested and the rice crop will undoubtedly be a short one. The cane crop promises to be an exceedingdly good one.

The staple foods in this province are rice and corn. Corn has gone up in some places as high as ₱3 per cavan, and some are expecting it to reach ₱4. At present rice is selling at ₱3. In some places the new rice is selling at ₱2.50. The little that has been gathered of the mountain crop is of fine quality, but there will not be enough for local use. The corn-planting season will begin in December; the last seed furnished by the Bureau of Agriculture has done well and it is recommended that more seed be furnished as the majority of the farmers never provide for emergencies and save just enough seed to plant once and if the first planting is a failure they must either borrow or beg. (Reports of the senior inspector of Constabulary and John C. Keefe, assistant agricultural inspector, Antique.)

CURRENT NOTES.

RUBBER IN AMBOS CAMARINES.

This office is indebted to Mr. B. C. Ray, agricultural inspector, for a very interesting note on the rubber experiments by Mr. H. R. Richmond, of Nueva Caceres. Mr. Richmond has 4,000 Pará trees which are now two years old and 4,000 trees one year old; he also has 200 *Castilloa* trees which are now three years old; they measure from 5 to 6 inches in diameter, and are from 22 to 25 feet high. A trial tapping of the *Castilloa* trees, which Mr. Ray believes are the best for that particular section, showed a good flow of latex, which produces a good quality of rubber. Mr. Richmond has also noted that both Pará and *Castilloa* trees grow better between abacá plants than they do in the open. From present appearances he believes that the *Castilloa* trees will produce their first seeds about the beginning of the fourth year.

THE SUBSISTENCE DEPARTMENT POTATO FARM NEAR LAKE LANAO.

A little more than a year ago an experiment was undertaken by the commissary department of the United States Army in the Philippines, in the growing of Irish potatoes in Mindanao. A piece of black sandy loam land lying on the south shore of Lake Lanao, at an elevation of 1,000 meters, including the military post at Camp Vicars, was selected for this purpose. The work on this place was rushed and every effort was made to get results at once. It was, however, subject to local military control which proved unsatisfactory and its status was changed so as to place the farm under the management of the chief commissary officer in Manila. Temporary buildings were erected, fences built, land plowed, potatoes planted, and in due time the harvest came. The yields varied all the way from nothing to 108 bushels to the acre; the quality, even of the small potatoes, was splendid.

The Bureau of Agriculture was requested to assist in some of the technical questions involved, and one of the principal improvements made was the liberal use of fertilizers, the absence

of which had led to much of the discouragement previously experienced. The officers and men in charge of this enterprise are enthusiastic and are making every effort for its success. The plan, however, does not seem to have met with popular favor among many military men, and a few of the more outspoken have pronounced it a failure already.

During a recent inspection of the farm by the Director of Agriculture he was unable to find any substantial reason for this prediction, and is very hopeful that if it be continued under good permanent management for a period of from three to five years, a method of growing potatoes in the Philippines can be successfully worked out.

COCONUTS ON THE SAN RAMON FARM.

During a recent inspection of the San Ramon farm by the Director of Agriculture, he was greatly impressed with the excellent results obtained there by planting coconuts at a distance of 30 feet each way. These trees were planted by the Bureau of Agriculture while in control of that farm from 1903 to 1905, principally on level sugar land lying near the beach. The trees were carefully cultivated while young and a number of catch crop experiments were conducted in connection with them. The trees are now from five to eight years old, and while they are not tall, many of them are 50 centimeters in diameter at the ground, show great vigor, and are producing excellent crops. This system of planting is more expensive than when the trees are placed closer together, but it is much better than crowding the trees so that their growth and yield will be correspondingly reduced.

THE MINDORO SUGAR PLANTATION.

November 1st saw the first step taken toward placing the big mill on the *hacienda* of the Mindoro Plantation and Development Company, when ground was broken on the site of the mill. The mill, which is being constructed in Honolulu by the Honolulu Iron Works Company, is expected to arrive some time in January, and the work of erection will begin immediately upon its arrival.

This mill will be a monster affair for these Islands; it will have a capacity of 2,000 tons of cane in twenty-four hours. At first it is intended that the mill will be used to crush only 500 tons a day, the amount will be increased to 1,500 tons and later, if necessary, to its full capacity.

As an up-to-date piece of machinery this mill will compare

with the best in the world and be surpassed by none, not even the much-heralded sugar fields of Java have anything which equals it. It has twelve rollers with crusher and centrifugal drying machines. The main power plant will be run by steam generated from bagasse, the fibrous refuse of the stalks after the juice has been extracted from them. All the auxiliary power in the mill will be run by electricity, which will be applied to the centrifugal drying machines, the cane carrier, the circulating pumps, and everywhere that an electrical service is possible.

The staff and the employees of the company will have an ice plant and a system of electric lighting for all of the quarters in the neighborhood of the mill. The main quarters of the laborers will be less than half a mile (0.80 kilometer) distant. It is planned to install the ice plant and the electric-light system at the same time as the mill, so that it should not be long before the company is making its own ice and manufacturing its own light.

A line of rails has already been laid for almost the entire 11 miles from Mangarin Point to the mill site, and a small locomotive is puffing back and forth with men and supplies. The locomotive is able to haul from 250 to 300 tons on the level, and from 40 to 50 tons on a 2 per cent grade. It is of 12 tons but a larger one of 25 tons has been ordered. There are also ten 20-ton freight cars for heavy freight, and fifty 5-ton cane cars of the Gregg type, such as are in use in Hawaii, Porto Rico, and Cuba. When the mill is in full operation about 1,500 of these cane cars will be used.

There are about 40 acres (16.18 hectares) planted to sugar at present, and it is planned to put 1,500 to 2,000 acres (607 to 810 hectares) under cultivation when the planting season opens. This cane will be harvested about January of 1912, and the actual work of milling will then be started. (Philippines Free Press, November 12.)

ANNUAL INDUSTRIAL AND COMMERCIAL EXPOSITION.

In a message to the Assembly the Governor-General has recommended the establishment of an annual Philippine industrial and commercial exposition to be held in Manila, at which the Insular Government and its various Bureaus, including the school department, shall make suitable exhibits of their activities and progress, and the provinces and municipalities shall exhibit their products and resources. Individuals and corporations are to be invited to send exhibits also.

The Governor-General explains that the purpose of the exhibition is to enable the people to see what the Government is doing for them through the several Bureaus. It is expected to offer opportunities to other countries to join in the exhibition so as to attract attention to this country.

He also points out that it is usual to charge admission, but much more good can be done by free admittance. He, therefore, recommends the appropriation of ₱100,000 to cover the cost and to enable the Government to purchase the exhibits from the provinces in order to establish a permanent commercial museum in Manila. (Cablenews-American, October 28.)

NOTES FROM OTHER FIELDS.

A PARASITE FOR THE SUGAR-CANE BEETLE.

It is reported that Mr. F. Muir, entomologist at large of the Hawaiian Sugar Planters' Association, has secured in New Guinea a parasite of the cane borer which causes such large losses on sugar plantations. This fly is said to be a fatal enemy of the sugar-cane beetle, and promises to eradicate the pest in a short time. All of the experiments that have been performed thus far have proved its efficiency, and the fly will be propagated in large numbers. Mr. Muir has searched for this parasite for more than two years, and if the search has been really successful, one of the greatest problems that now confront the sugar industry will have been solved.

BUTTER FROM COCONUT OIL.

The United States consul-general at Hamburg, Germany, is quoted in the British Trade Journal, volume 48, No. 573, as saying that the recently perfected methods for manufacturing butter from crude coconut oil have caused this business to grow very rapidly in Germany. Seven companies are now crushing copra, and refining oil for edible use, the products being sold under various names. The importations of raw copra into Germany have more than doubled during the past three years, and only the limited supply available prevents a greater amount from being manufactured, for the market is constantly increasing. To obtain a first-class butter it is stated that oil from the first pressing is required, which is bleached with fuller's earth. "The raw material contains 60 to 70 per cent of fat, which is not uniform, but the mixture of several fats, which explains why a cold-pressure oil or one obtained by means of moderate pressure is more solid than one obtained by high pressure and high temperature. The oil is either white or very light yellow, with a characteristic sweet odor, particularly noticeable when heated. The melting point is about 76° F., and varies between 68° and 82°. The melting point of the sebacic acid is 76°. The saponification qualities of the oil render it invaluable for mixing with oils which alone would yield a very soft soap, so that it may be

said that no important manufacture of white soap is undertaken without a large proportion of coconut oil, whereby the soap cakes acquire a satisfactory degree of hardness."

Upon consulting the official records of exports of copra from the Philippines in 1907, 1908, and 1909, it is found that the total exportation and the exportation to Germany were as follows:

Year.	To Germany.	Total.
	Pounds.	*Pounds.*
1907	7,496,053	129,239,026
1908	7,383,955	214,937,415
1909	21,995,501	240,374,599

The amount of copra exported to Germany and Belgium has increased in greater proportion than that exported to any other countries, and these two countries take nearly one-seventh of the total exportation, the amount shipped to Belgium in 1909 being 12,578,850 pounds.

FALLING OFF OF THE SUGAR CROP IN HAWAII.

The output of sugar for the past year in the Hawaiian Islands shows a decided falling off from recent years. The yield was 428,000 tons against 535,000 tons for the preceding year and 521,123 tons for the year previous. Several causes are ascribed as accounting for this result, two of which are the scarcity of labor and the decrease in the artesian water supply. Japanese laborers have almost entirely replaced the Chinese help on the sugar plantations and have become more or less independent as a result of the abundant prosperity in those islands. This has resulted in higher prices for labor, and there has been one rather serious labor strike.

The Hawaiian sugar planters are now turning to the Philippines for relief and are taking thousands of Filipinos to Honolulu each year for work on the plantations of the Hawaiian Sugar Planters' Association. This movement has met with some opposition in the Philippines, yet it is conceded that the number of laborers taken will not seriously effect the labor supply here, and those who actually work on the sugar plantations there will be better fitted for the same work when they return to the Philippines. The entire population of the Hawaiian Islands is but little more than half of the population of the city of Manila. The area planted to sugar cane is about 100,000 acres (40,470 hectares), or less than the area now planted in the Island of Negros in the Philippines. However, the Hawaiian

Islands derive an income of from ₱80,000,000 to ₱90,000,000 per annum from their sugar crop on account of the high rate of production and of modern milling methods, while the Philippines, with a much larger area planted, exports sugar to the value of only about ₱15,000,000.

CASTILLOA RUBBER IN JAMAICA.

The Journal of the Jamaica Agricultural Society, Volume XIV, No. 9, contains some valuable suggestions by the director of agriculture (Hon. H. H. Cousins) concerning *Castilloa* rubber. He points out that the yield of rubber obtained from particular trees does not necessarily indicate the peculiar attributes of the species, for it is "quite possible for a *Castilloa* to grow into a large forest tree and to yield enormous quantities of latex of good quality under such favorable conditions as intense humidity, protection from wind, rich soil—conditions favoring the rankest vegetation—while the same tree, if planted in a region of dry atmosphere with frequent droughts and a sunburnt soil, might develop into a poor, weakly tree, with a very inferior flow of latex." Mr. Cousins states that, in general, "the nearer to the equator and the more uniform the heat and moisture, the greater are the prospects for a good yield of rubber from such trees as *Hevea* and *Castilloa*."

The use of *Castilloa* for shade purposes is not recommended. A case is cited in which the *Castilloa* trees not only ruined the coffee, which they were supposed to protect, but did not develop themselves, because they were planted too closely. Mr. Cousins quotes a number of authorities who agree in that they believe *Castilloa* is not suitable for shade on cacao plantations and strongly advise that it be planted separately.

Another note in the same magazine calls attention to the danger of allowing the old cacao pods, dead sticks, etc., to remain on the ground under the cacao trees. These form constant sources of danger to the trees through the fungi which grow on them and should be disposed of by burning or burying under the soil.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR OCTOBER.

By KER & Co.

[Based on advices from San Francisco, September 29; London, October 13; Hongkong, October 25; Singapore, October 28; Iloilo, October 28; Cebu, October 29.]

SUGAR.

Iloilo.—Sales are reported of old crop, No. 3, on basis of ₱6.40 per picul f. o. b. for prompt shipment to China. No quotations on new crop as yet.

HEMP.

Arrivals of lower grades during the fortnight have been heavy and market closes dull on basis of ₱8.25 per picul for current (United States quality). Values of better qualities are however maintained. Receipts at all ports for the ten months ending October 31 were 1,133,819 bales, as against 1,075,009 for the corresponding period of 1909, and 861,240 in 1908.

COPRA.

Market is steady at ₱11.12½ fair merchantable, and ₱11.75 Cebu fair merchantable sun dried; arrivals not so large as for the previous two weeks.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE TEN MONTHS (JANUARY TO OCTOBER, 1910.)

Products exported.	United States.	China.	Pacific Coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Malay States and India.
Dry sugar (tons)	82,681	15,421	12,932					6
Hemp (bales)	483,839	12,361	42,648	416,944	64,222	18,795	12,583	9,196
Copra (piculs)	5,600		88,320	56,800	1,329,476		4,021	
Cigars (thousands)	35,843	32,371	23,939	6,779	17,065	13,776	338	13,839

MANILA, NEW YORK, AND LONDON FIBER MARKET.

HEMP.[1]

The following quotations on Manila hemp and sisal are taken from the report of Messrs. Hanson & Orth, dated New York and London, October 1, 1910:

Market, September 30, 1910.

		Shipment—steady.	
	Steady spot.	September to October.	November to December.
	Cents.	*Cents.*	*Cents.*
Superior seconds	4⅞	4¾	4¾
Fair current	5⅛	5	5
25 per cent over current	5⅜	5⅛	5⅛
Midway	7⅝	7⅜	7⅜
Good current	8⅛	8⅛	8⅛
50 per cent over good current	8¾	8⅜	8⅜
Superior good current	9⅛	8¾	8¾

Lowest and highest shipment price for current for the month, 5 cents.

World's visible supply, September 30, 1910.

	1910	1909
	Bales.	*Bales.*
United States—stocks New York and Boston	2,090	4,702
Afloat	127,226	200,230
Loading	23,000	41,000
Total	152,316	245,932
United Kingdom—stocks	46,000	38,272
Afloat	97,000	66,275
Loading	9,000	4,000
Total	152,000	108,547
Manila estimated stock	207,000	122,000
World's visible supply	511,316	476,479

Hemp arrivals at Manila during October, 1910.

Provinces.	Piculs.	Bales.
Albay	74,876	37,438
Sorsogon	33,045	16,522
Camarines	16,876	8,438
Leyte	24,418	12,209
Samar	11,249	5,625
Mindanao	13,678	6,839
Other districts	11,358	5,679
Cebu	20,842	10,421
Total	206,342	103,171

[1] Quotations are given in cents, United States currency, per pound.

Telegram from Manila to London, November 7, 1910.

Receipts and shipments.	1910	1909
	Bales.	*Bales.*
Hemp receipts at Manila since January 1	887,194	814,603
Hemp receipts at Cebu, etc. since January 1	266,448	287,210
Hemp receipts at all ports since January 1	1,153,642	1,101,813
Shipments to United Kingdom by steamer, cleared since January 1	417,719	347,088
Shipments to Atlantic coast, United States, by steamer, cleared since January 1	428.580	527,297
Shipments to Pacific coast, United States, by steamer, cleared since January 1	93,080	110,190
Shipments to continental ports, by steamer, cleared since January 1	68,122	52,522
Shipments to all other ports	53,473	
Local consumption since January 1	10,000	
	63,473	48,820
Loading steamer on the berth for the United Kingdom, about	32,000	
Loading steamer on the berth for the Atlantic coast, United Sates, about		18,000
Loading steamer on the berth for the Pacific coast, United States, about	7,000	4,000
Shipments per sailer to Atlantic coast, United States, since January 1	20,650	21,730

Bales of hemp loading for United Kingdom, by steamers—

Invertay	18,000
Antilochus	6,000
Glenlee	8,000
	32,000

Bales of hemp loading for Pacific coast, by steamer—

Ayemeric	7,000
Total	39,000

SISAL.

Market quiet; firm, spot $4\frac{9}{16}$ cents; lowest shipment price for the month, $4\frac{7}{16}$ cents; highest shipment price for the month, $4\frac{9}{16}$ cents.

MAGUEY.[1]

About 1,500 bales of spot maguey were sold during the month, but no business is reported for shipment. We quote No. 1 Cebu at $4\frac{3}{8}$ cents and No. 2 Cebu 4 cents, September to October shipment.

ILOILO SUGAR MARKET FOR OCTOBER.

By Figueras Hermanos.

The amount of sugar received from the mills and sugar districts during the month of October amounted to 15,180 piculs. The market for the sugar crop opened on the 1st day of October at 6 pesos and 2 reales [2] and continued until the 6th when it

[1] From the report of Messrs. Smith & Schipper, dated New York, September 1, 1910.

[2] One real equals $12\frac{1}{2}$ centavos.

went up to 6 pesos and 3 reales, but on the 8th it dropped to 6 pesos and 2 reales again. The price was only nominal for the remainder of the month.

The following summary of the Iloilo sugar market indicates the range in price for the 1909–10 sugar crop. In November and December there was a gradual increase in the price amounting to about 1 peso; in January and February the price rose rather rapidly; in January from 6 pesos and 6 reales to 7 pesos and 4 reales, and in February from 7 pesos and 4 reales to 8 pesos and 4 reales. The maximum price, 9 pesos, was paid in the latter part of March. During April the price fell to 8 pesos and 2 reales and in May and June remained more or less stationary with a gradual decrease; in July the price rose to 8 pesos and 4 reales. During August, September, and October there has been few buyers and the closing quotation for the sugar crop of 1909–10 was 5 pesos and 6 reales.

October shipments.

Date.	Vessel.	Destination.	Superior.	Wet.
			Piculs.	*Piculs.*
September 30	Kaifong	Hongkong	12,455	
October 12	Tringganu	Singapore	4,000	
October 25	Kaifong	Hongkong via Cebu	4,798	
Total for October			21,253	

Exports up to October 31.

(In piculs.)

To—	1908–9 crop.		1909–10 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	808,400		1,222,800	
Japan	50,667	8,915		
China	773,649		91,450	486
Total	1,632,716	8,915	1,314,250	486

Estimated sugar crop 1910–11 for Panay and Negros.

	Piculs.
Panay:	
Balasan	6,000
Barotac Nuevo, Dumangas, Zarraga, Dingle, and Pototan	104,000
Concepcion, Ajuy, and Sara	46,000
Province of Capiz	10,000
Province of Antique	70,000
Total	236,000
Negros:	
Victorias	54,000
Valladolid	16,000
Manapla and Sicaba	97,000
Bayauan	2,000
Ginigaran	48,000
Himamaylan and Suay	68,000
Tanhay, Amblan, and Ayuquitan	11,000
San Carlos and Vallehermoso	176,000
Bais	77,000
Cabancalan and Ilog	141,000
Binalbagan	37,000
La Carlota, Pontevedra, San Enrique, and Candaguit	219,000
Isabela	158,000
La Castellana	31,000
Bago	175,000
Bacolod, Granada, Murcia, and Sumag	73,000
Talisay	101,000
Silay, and Eustaquio Lopez	190,000
Saravia	80,000
Dumaguete, Nueva Valencia, Bacong, and Sibuyan	6,000
Cadiz Nuevo and Sagay	100,000
Total	1,840,000

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the COLLECTOR OF CUSTOMS.

OCTOBER, 1910.

IMPORTS.

Articles.		Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Davao.	Totals.
Rice	Quantity	Kilos	12,460,840	3,249,431	1,835,564	120,295	271,785			17,937,915
	Value	Dollars	415,647	110,324	57,232	4,854	10,060			598,117
Beef cattle	Quantity	Number	7,179	202	843		10			8,234
	Value	Dollars	120,672	5,050	35,075		255			161,052
Sugar	Quantity	Kilos	169,429	24,856	29,485	7,888	8,457			240,115
	Value	Dollars	11,815	1,946	2,155	617	592			17,125
Coffee	Quantity	Kilos	13,594	785	4,081	436	1,761			20,657
	Value	Dollars	3,725	204	918	121	475			5,443
Cacao	Quantity	Kilos	61,148	4,433	36					65,617
	Value	Dollars	15,912	1,097	19					17,028
Eggs	Quantity	Dozen	332,028		229					332,257
	Value	Dollars	25,461		22					25,483
Raw cotton	Quantity	Kilos	22,937		100					23,037
	Value	Dollars	8,317		60					8,377

EXPORTS.

Hemp	Quantity	Kilos	13,209,969	5,189,251		5,056	55			18,404,331
	Value	Dollars	1,364,950	536,074		454	8			1,901,486
Sugar	Quantity	Kilos	290,997	23,100	1,132,278					1,446,375
	Value	Dollars	11,444	1,390	58,640					71,474
Copra	Quantity	Kilos	7,460,392	7,144,460	251,138	84,374	256,216	1,017		15,197,597
	Value	Dollars	672,105	689,151	24,434	7,923	23,832	56		1,417,501
Cigars	Quantity	Thousand	13,471							13,471
	Value	Dollars	146,194							146,194
Cigarettes	Quantity	Thousand	2,978							2,978
	Value	Dollars	3,458							3,458
Tobacco	Quantity	Kilos	1,317,169		27					1,317,196
	Value	Dollars	209,484		10					209,494

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

OCTOBER, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.						Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.7	------	28	1.5	27.2	0.3	27.2	8.9	26.8	8.9	27.8	2.3
2	25.9	90.2	24.7	30.5	26.3	8.6	27.4	33	26.5	38.1	28.1	22.4
3	24.4	17.2	26.5	------	25.4	------	27.6	------	24.5	99.6	26.3	2.5
4	26.6	------	27.2	2.6	26.6	------	27.8	1.3	24.7	14	26.2	------
5	26.9	.8	27.8	------	26.7	------	28	------	27	1	27.6	------
6	27.4	------	27.6	.5	27	4.8	28.6	1.3	27.2	------	27.8	.3
7	26.6	------	27.2	------	26.1	3	28.6	.8	27	7.9	27.3	------
8	26.5	1.5	27.7	------	27	------	28.1	10.2	25.7	22.6	27.9	27.9
9	25.4	8.9	27	16.3	27.2	------	28.1	7.9	25.9	1.3	26.3	------
10	25.9	------	27	------	25.8	16.8	27.6	1	26.2	------	26.6	------
11	25.9	2.3	27	------	25.4	.8	27.8	------	25.7	.5	27	------
12	25.2	------	26.4	1.3	25.7	1.8	27.8	------	24.7	6.6	26.8	------
13	26.2	------	27.4	3	26.9	------	28	7.6	25.8	------	27	------
14	25.7	6.1	27.1	------	26.5	31.2	27.6	------	24	1.8	26.8	------
15	25.7	29	25.8	61	25.6	------	27.8	------	25	------	27.9	------
16	26.6	62.2	26.8	23.1	26.6	------	27.4	------	26.2	------	27.3	------
17	25.1	32.3	26.2	------	26.9	------	28.2	------	26.2	------	27.7	------
18	26.8	4.1	26.2	4.5	26.1	------	27.7	------	26.3	------	27.2	------
19	27.8	------	25.8	24.4	27.1	4.1	27.2	------	26.6	------	26.9	------
20	27.6	------	27.6	------	27.4	------	27.6	------	26.4	------	27.8	------
21	26.6	9.4	26.9	------	27.4	------	27.8	------	26.4	------	27.6	------
22	27	27	27	3	27	1.5	27	------	25.4	.3	27.2	------
23	26.1	23.7	26.7	8.9	27.5	6.1	28	------	26.1	------	27.6	------
24	26.9	.3	26.4	2.8	27.2	------	28.2	------	26.8	------	27.6	------
25	27.1	9.2	25.8	4.1	27.2	------	27.8	------	26.3	17.5	27.3	------
26	27.6	7.8	26.6	1.5	27.5	2	28.2	------	25.6	7.1	27	23.4
27	28	2.5	26.1	29.8	27.6	31.7	28.4	------	25.4	------	27.6	------
28	26.5	17.3	25.8	8.4	25.9	1.3	27.6	------	26.8	------	27.4	------
29	27.5	21.4	25.4	19.8	27.5	------	27.8	------	25.6	25.6	26.7	------
30	26.4	16.7	25.7	4.6	26.2	16.7	28.4	------	26.9	10.4	27.8	------
31	26.9	30.6	26.2	69.1	25.7	37.8	28.6	------	25.8	22.6	27.6	------

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING JUNE 30, 1910.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Agusan:		*Hectares.*	*Hectares.*		
Rice	Good	347	20	10,575	Liters.
Abacá	do	18	1,025	453,945	Kilos.
Copra	do			52,181	Do.
Corn	do	9	12	45,000	Liters.
Albay:					
Rice	Fair	1,264	484	532,500	Do.
Abacá	Good	733	17,561	4,522,312	Kilos.
Copra	do			331,809	Do.
Corn	Fair	336	409	123,225	Liters.
Cacao	Good	1	31	17,480	Kilos.
Ambos Camarines:					
Rice	Fair	1,233	4,186	497,400	Liters.
Abacá	do	462	6,205	1,412,562	Kilos.
Copra	do			311,000	Do.
Sugar cane	do	58	136	9,930	Do.
Corn	do	222	265	238,425	Liters.
Antique:					
Rice	Good	11,516			
Copra	do			36,179	Kilos.
Sugar cane	do	75	5	13,915	Do.
Tobacco	Fair		43	20,700	Do.
Corn	Good	391	659	229,325	Liters.
Bataan:					
Rice	do	161	328	911,400	Do.
Corn	Fair	187	29	67,350	Do.
Batangas:					
Rice	do	21,932	35	23,625	Do.
Abacá	do	10	285	66,349	Kilos.
Sugar cane	do	1,203	920	2,199,961	Do.
Tobacco	do		38	15,180	Do.
Corn	Good	5,022	45	20,250	Liters.
Bohol:					
Rice	Fair	2,872	12,795	9,387,363	Do.
Abacá	do	5,977	462	217,547	Kilos.
Maguey	Good	25	95	170,712	Do.
Copra	Fair			834,647	Do.
Sugar cane	do	80	99	284,562	Do.
Corn	do	3,239	2,008	2,694,675	Liters.
Bulacan:					
Rice	do	2,385	7,975	16,362,075	Do.
Sugar cane	Good	219	210	327,635	Kilos.
Tobacco	Fair		30	11,500	Do.
Corn	do	1,874	36	42,225	Liters
Cagayan:					
Rice	Good	2,068	292	296,250	Do.
Sugar cane	Fair	52	21	3,921	Kilos.
Tobacco	do	921	5,069	968,944	Do.
Corn	do	3,204	2,683	2,740,875	Liters.
Capiz:					
Rice	do	23,735			
Abacá	do	343	1,266	190,952	Kilos.
Copra	do			192,406	Do.
Tobacco	do	30	298	60,120	Do.
Corn	Good	739	460	405,750	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Cavite:		*Hectares.*	*Hectares.*		
Rice	Fair	3,524	1,577	2,814,675	Liters.
Abacá	do	870	3,206	210,812	Kilos.
Sugar cane	Good	805	32	7,457	Do.
Corn	do	781	5	2,250	Liters.
Cebu:					
Rice	do	1,369	300	536,175	Do.
Abacá	do	125	1,521	735,155	Kilos.
Maguey	do	180	1,715	670,260	Do.
Sugar cane	do	1,241	547	993,796	Do.
Tobacco	Fair	20	2,572	1,672,256	Do.
Corn	do	37,386	16,661	12,182,625	Liters.
Ilocos Norte:					
Rice	do	664	647	1,091,775	Do.
Maguey	do	221	49	15,812	Kilos.
Tobacco	do	58	987	403,190	Do.
Corn	do	1,042	972	926,100	Liters.
Ilocos Sur:					
Rice	do	773	3	450	Do.
Abacá	Good	12	145	320,860	Kilos.
Maguey	do	47	661	566,049	Do.
Sugar cane	do	408	614	1,189,859	Do.
Tobacco	Fair	5	614	314,456	Do.
Corn	do	1,546	1,782	1,508,250	Liters.
Iloilo:					
Rice	do	8,509	----------	----------	
Abacá	do	111	530	145,348	Do.
Copra	do	23,358	898,437	94,432	Kilos.
Sugar	Good	1,020	720	1,086,065	Do.
Tobacco	Fair	260	1,201	124,982	Do.
Corn	do	4,083	382	270,975	Liters.
Isabela:					
Rice	Good	1,209	336	138,450	Do.
Tobacco	do	37	13,316	10,218,762	Kilos.
Corn	do	24,110	7,190	4,449,825	Liters.
La Laguna:					
Rice	Fair	1,280	1,994	2,243,550	Do.
Abacá	do	12	923	264,180	Kilos.
Copra	do	----------	----------	1,066,458	Do.
Sugar cane	Good	132	48	108,853	Do.
Corn	Fair	308	168	146,400	Liters.
La Union:					
Rice	do	1,875	----------	----------	
Maguey	Good	26	109	138,328	Kilos.
Sugar cane	do	160	248	482,850	Do.
Tobacco	Fair	----------	2,797	659,226	Do.
Corn	do	985	116	35,775	Liters.
Leyte:					
Rice	Good	3,952	4,901	9,923,475	Do.
Abacá	Fair	1,444	14,881	5,423,635	Kilos.
Copra	Good	----------	----------	731,107	Do.
Sugar	do	68	267	275,390	Do.
Tobacco	Fair	200	336	102,948	Do.
Corn	do	1,522	2,250	1,571,025	Liters.
Mindoro:					
Rice	Good	3,015	10	42,525	Do.
Abacá	do	189	156	529,529	Kilos.
Copra	do	----------	----------	85,577	Do.
Corn	do	160	43	32,550	Liters.
Misamis:					
Rice	Fair	1,110	83	62,250	Do.
Abacá	do	160	2,444	851,402	Kilos.
Copra	Good	----------	----------	278,616	Do.
Corn	Fair	846	498	709,050	Liters.
Moro:					
Rice	Good	1,546	540	490,275	Do.
Abacá	do	1,499	1,277	945,271	Kilos.
Copra	do	----------	----------	188,611	Do.
Sugar cane	Fair	51	16	17,394	Do.
Corn	Good	364	89	67,350	Liters.
Mountain:					
Rice	Fair	1,773	2,363	3,623,550	Do.
Sugar cane	do	57	56	6,135	Kilos.
Tobacco	do	----------	66	16,376	Do.
Corn	do	1,114	1,305	392,325	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Nueva Ecija:		*Hectares.*	*Hectares.*		
Rice	Good	597	2,536	11,252,400	Liters.
Sugar cane	do	180	58	60,060	Kilos.
Tobacco	do	107	454	97,304	Do.
Corn	do	1,264	85	33,075	Liters.
Nueva Vizcaya:					
Rice	Fair	1,712			
Copra	Good			50,600	Kilos.
Corn	do	145	26	30,750	Liters.
Occidental Negros:					
Rice	Fair	5,956	500	552,450	Liters.
Abacá	Good	452	676	202,337	Kilos.
Copra	do			285,890	Do.
Sugar cane	do	3,206	6,396	15,064,063	Do.
Tobacco	Fair	700	528	194,782	Do.
Corn	do	2,713	938	905,000	Liters.
Oriental Negros:					
Rice	Good	759	520	507,750	Do.
Abacá	do	2,665	2,203	644,201	Kilos.
Copra	do			525,291	Do.
Sugar cane	Fair	1,046	86	366,672	Do.
Corn	do	8,922	576	258,675	Liters.
Palawan:					
Rice	do	1,658			
Abacá	Good	20			
Copra	do			33,459	Kilos.
Corn	Fair	21			
Pampanga:					
Rice	do	8,677	5,707	6,778,945	Liters.
Sugar cane	do	1,230	330	423,775	Kilos.
Corn	do	1,728	690	546,900	Liters
Pangasinan:					
Rice	Good	11,335	100	79,950	Liters.
Abacá	Fair		1,563	594,423	Kilos.
Copra	Good			149,207	Do.
Sugar cane	do	294	213	143,514	Do.
Tobacco	do		1,399	745,008	Do.
Corn	do	8,295	2,917	4,236,150	Liters.
Rizal:					
Rice	do	1,144	1,813	3,682,800	Do.
Sugar cane	Fair	122	445	412,706	Kilos.
Corn	do	916	250	137,100	Liters.
Samar:					
Rice	do	3,265	5,888	10,658,025	Do.
Abacá	Good	3,520	3,627	1,681,123	Kilos.
Copra	Fair			218,023	Do.
Sugar cane	do	231	120	51,612	Do.
Corn	Good	411	1,935	891,700	Liters.
Sorsogon:					
Rice	do	1,397	10,757	6,112,275	Do.
Abacá	do	332	37,592	8,150,205	Kilos.
Copra	do			651,349	Do.
Sugar cane	Fair	67	169	56,419	Do.
Corn	do	1,397	339	326,925	Liters.
Surigao:					
Rice	Good	110	24,845	2,796,500	Do.
Abacá	do	164	1,574	390,822	Kilos.
Copra	do			175,762	Do.
Sugar cane	do	38	16	4,364	Do.
Corn	do	453	3	2,100	Liters.
Tarlac:					
Rice	Fair	1,505	170	117,000	Do.
Sugar cane	Good	3,104	2,200	3,428,150	Kilos.
Tobacco	Fair		99	7,452	Do.
Corn	do	412	575	105,900	Liters.
Tayabas:					
Rice	Good	8,594	9,532	12,848,925	Do.
Abacá	do	470	2,399	762,921	Kilos.
Copra	Fair			2,865,351	Do.
Sugar cane	do	129	366	494,022	Do.
Tobacco	do	21	238	46,598	Do.
Copra	Good	686	104	38,550	Liters.
Zambales:					
Rice	Fair	436			
Sugar cane	do	27	4	7,600	Kilos.
Corn	Good	54	34	21,450	Liters.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abacá, copra, sugar, tobacco, and corn, quartr ending June 30, etc.

[NOTE.—75 liters=1 cavan; 63 kilos=1 picul; 46 kilos=1 quintal.]

Provinces.	Unhulled rice per 75 liters.		Abacá per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	₱4.75	₱2.50	₱10.00	₱7.00	₱12.00	₱7.50						
Albay	3.50	2.20	15.00	6.75	11.00	6.33					₱3.00	₱2.00
Ambos Camarines	4.50	2.00	13.00	6.00	12.50	5.00	₱8.00	₱4.00			4.00	1.50
Antique	3.12	1.50			10.00	7.00	8.00	5.00	₱22.50	₱6.00	4.50	1.50
Bataan	3.50	2.00					9.00	6.00			2.50	1.00
Batangas	3.50	2.40	13.50	10.00			9.00	4.50	12.00	6.00	4.00	2.50
Bohol	4.00	1.50	15.50	8.00	13.00	7.50	9.00	4.00	26.00	4.50	5.50	2.50
Bulacan	3.00	1.35					8.50	7.00	18.00	8.50	5.00	2.00
Cagayan	4.25	1.75							30.00	6.00	3.25	2.00
Capiz	3.75	1.10	16.00	8.00	11.00	5.00	8.00	6.00	30.00	6.00	5.00	1.25
Cavite	3.50	2.00					9.40	5.25	16.00	10.00	3.60	1.00
Cebu	5.00	3.00	15.50	9.00	12.00	6.00	9.50	5.00	20.00	4.00	3.00	2.50
Ilocos Norte	3.25	2.00					8.00	4.00	16.00	3.00	5.00	3.00
Ilocos Sur	4.75	2.20			10.00	5.00	7.00	4.00	26.40	4.50	3.00	1.00
Iloilo	3.40	1.75	14.00	12.00	12.00	6.50	9.25	6.00	25.00	3.50	5.00	1.00
Isabela	5.62	4.50							30.00	7.20	3.00	1.20
La Laguna	3.50	2.00	12.00	5.00	9.00	6.00	8.20	5.00			5.00	3.00
La Union	3.50	1.50			8.00	5.00	6.60	4.00	9.00	5.00	4.00	1.50
Leyte	4.00	2.00	14.00	7.00	12.00	5.00	9.75	4.00	25.00	5.00	4.00	1.40
Mindoro	4.00	2.00	15.00	9.00					30.00	7.50	4.50	1.50
Misamis	4.00	2.00	12.00	7.00	12.00	8.00	9.50	7.00	26.00	5.00	4.00	2.00
Moro	3.50	2.00	15.50	8.85	11.50	8.00	7.00	4.00	30.00	25.00	4.50	2.00
Mountain	7.50	2.50			6.00	5.00	8.25	4.00	10.00	2.50	3.50	2.00
Nueva Ecija	2.77	1.25					9.00	5.00	23.00	5.00	4.00	1.00
Nueva Vizcaya	6.00	3.12							21.50	11.00	5.00	1.25
Occidental Negros	3.75	2.25	16.00	8.00	12.00	6.00	8.75	6.50	25.00	5.40	3.75	1.75
Oriental Negros	4.00	2.50	13.00	7.60	12.30	7.00	8.50	6.50	25.00	5.50	4.00	2.00
Palawan	4.00	3.00			8.50	5.50					5.00	3.20
Pampanga	3.00	1.75					8.00	6.50			2.00	2.00
Pangasinan	4.50	1.50			10.00	5.00	8.00	5.00	20.00	5.00	3.00	1.25
Rizal	3.25	2.25					9.50	6.75			4.00	1.50
Samar	3.50	1.25	15.00	8.00	9.00	5.00					3.00	2.00
Sorsogon	3.75	2.00	11.40	4.00	10.12	5.50	8.00	6.00	30.00	6.00	4.00	2.00
Surigao	3.12	1.50	12.70	7.25	10.00	7.50			30.00	6.00	4.00	1.50
Tarlac	4.00	1.75					8.50	4.00			3.00	2.00
Tayabas	3.50	1.00	15.50	5.50	9.80	5.00	9.00	7.50	12.00	9.00	2.50	2.00
Zambales	2.50	1.90			10.00	7.00	9.40	4.00	15.00	4.00	5.00	1.40
									20.00	6.00	4.00	2.00

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